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NATURAL HISTORY

OF THE

FISHES OF GUIANA.

PART I.

BY

ROBERT H. SCHOMBURGK, ESQ.

ILLUSTRATED BY THIRTY-FOUR COLOURED PLATES,
WITH PORTRAIT OF THE AUTHOR.

S I

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OF

R. H. SCHOMBURGK.

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ICHTHYOLOGY.

VOL. III.

FISHES OF GUIANA.

PART I.

BY

ROBERT H. SCHOMBURGK, ESQ.

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FROM THE PUBLISHER.

The subject of the present Volume is one upon which we remarked before that we had not much indulged, and that for various reasons; in particular, because we did not incline to load our interesting Work with common-place illustrations which have served the purpose of all the publications on Ichthyology lately issued from the Press; and the vast extent of the subject, with our scanty knowledge of their habits, have deterred us from devoting a large portion of our space to this department of Zoology.

The illustrations now produced are from the subjects collected in regions in almost every case first explored by the Author himself; and they are in every instance original, and now for the first time published to the world. The Volume contains only the first portion of these interesting forms. We again call the attention of our readers to the Account of the Author at the beginning of the Volume, as it contains, amongst other interesting matter, a succinct account of his voyages and travels.

Upon taking a review of our labours, which have been so liberally acknowledged by the public, we find we have brought out

ELEVEN VOLUMES ON ORNITHOLOGY,
TWELVE VOLUMES ON MAMMALIA,
SIX VOLUMES ON ENTOMOLOGY, AND
THREE VOLUMES ON ICHTHYOLOGY,

making in all Thirty-two Volumes; and as we are in a state of great forwardness with the remaining eight, our subscribers and the public may rest assured that the whole Forty, of which the Work is to be composed, will be published in twelve

or fifteen months from this date. The following are the subjects of those in the Press:—

Vol. 33. Fishes of British Guiana, by Schomburgk, Part Second.

—— 34. Exotic Moths, with a copious dissertation on the Silk Moths, by Duncan, with Portrait and Memoir of Latreille.

—— 35. British Birds, Part Third, by Sir William Jardine, with Portrait and Memoir of Walker.

—— 36. Introduction to the Mammalia, by Col. Charles Hamilton Smith.

—— 37. Sun Birds, by Sir William Jardine, with Portrait and Memoir of Willoughby.

—— 38. British Birds, Part Fourth, by Sir William Jardine, with Portrait and Memoir of Drury.

—— 39. British Fishes, Part First, with Portrait and Memoir of Humboldt.

—— 40. British Fishes, Part Second, with Portrait and Memoir.

However much we have been and continue to be encouraged in this popular Work, we owe it to some of our patrons to publish the foregoing assurance of its termination,—and, when completed, we trust it will be found and esteemed to be a useful, highly ornamental, and cheap body of information, which we flatter ourselves forms a point in British Literature and Science peculiarly its own. The

possibility of laying before the world illustrated works of the highest class in every department, at so cheap a rate, has been demonstrated by our successful labours, and has given rise to others by which mankind have been benefited; and we hope that although this Series of the NATURALIST'S LIBRARY will soon be brought to a close, we shall immediately follow it up with other distinct similar works in various departments, the particulars of which will be ere long submitted to the consideration of our supporters.

3, ST. JAMES' SQUARE,
July, 1841.

MEMOIR

OF

ROBERT H. SCHOMBURGK.

In the biographical sketch which accompanies the portrait given with the present volume of the Naturalist's Library,* we have ventured to make a slight deviation from the original plan of the Work, by detailing some passages in the career of a living traveller and naturalist. This has probably in many instances been considered liable to objections, but we have endeavoured to avoid all matters which could intrude on the privacy of any member of an honourable family, and have only recorded some anecdotes of the early dispositions and pursuits of an individual who, persevering through many diffi-

* We are indebted to Mr. Brochedon for the use of an original sketch taken for his private portfolio, and cannot too highly express our thanks to that gentleman for his civility in complying with our request, and for his attention in superintending the progress of the engraving.

culties, has worthily received the reward of his labours in the high scientific rank which he now holds, and in the marked approbation of the sovereign of Great Britain, as well as of those of other European kingdoms. The greater part of the information we possess has already appeared in some of the German newspapers, and we have heard much of it confirmed by our traveller himself; we now have only to regret that, being already far on his way to resume his labours in another hemisphere, our notes cannot have his own revision. The later and more active part of Mr. Schomburgk's life is best seen in his journals of the expeditions, during which the subjects forming the chief part of the materials for "The History of the Fishes of Guiana" were collected. These, indeed, are almost essential for the illustration of the subject; and we have added a condensed account of the wanderings of the discoverer of the *Victoria regalis*, introducing at times his own accounts of scenery and vegetation, as accessory to the history of the fishes of the mighty rivers which water one of our richest but even yet, perhaps, least known colonies. For this information we acknowledge being much indebted to the Reports published in the "Journal of the Royal Geographical Society," and trust that we shall not be considered as having drawn too largely from its valuable pages, more particularly as the extensive circulation of our volumes may tend to further the cause of geographical science so ably supported by the periodical alluded to, and may enlist some

strangers to take a deeper interest in the improvement of the productions of the colony, and, above all, in that of the moral and religious condition of the Indian tribes, who seem so capable of cultivation, and of being most usefully employed in assisting to spread still further the higher blessings of civilization.

Robert Hermann Schomburgk, descended from an old family, which it was said came originally from Denmark, was born on the 5th June 1804, at Freyburg on the Unstrect, a small town in the Prussian province of Saxony, in the government district of Merseburg, where his father, a Protestant minister, at the time resided, and to whose care he was indebted for the rudiments of his education. His love for botany developed itself at an early period, and a small spot in his father's garden being given up to him, soon displayed a collection of flowers, which, although transplanted only from the neighbouring woods or meadows, were distinguished for their beauty or curiosity. Being intended for the mercantile world, the study of modern languages was early commenced, and the boy had left his paternal home and entered on his intended profession before he had reached his fourteenth year; but although yielding to the wishes of his relations, his love for plants did not leave him in the counting-house, and whenever a leisure moment permitted it, he eagerly pursued his favourite study. In 1823 he entered the counting-

house of his uncle, Henry Schomburgk, in Leipsic, and having there better opportunities of making himself acquainted with the science of botany, he not only attended the lectures of Professor Schwägrichere, but also received private instructions, while every facility was offered to him to visit the collections of living plants, for which that city was then famed. An ardent desire to travel became equally apparent, as naturally resulting from his particular line of studies; excursions were made to many parts of Hesse and the Rhine, journeys were also undertaken to the Hartz and distant parts of Thuringia, and resulting from these, several botanical and horticultural observations were communicated, under the name of Robert Hermann, to the Bavarian Garten Zeitung, Thuringer Vater-lands Kunde. But although his uncle was kind and indulgent, he, nevertheless, did not approve of his following the study of botany with more ardour than that of commercial accounts, and it is related that the worthy man gave up all hopes that his nephew would ever shine as a merchant, when, upon entering his room, he discovered, to his surprise and mortification, that the ledgers and other mercantile books were used to press and to prepare plants for the Herbarium.

He became now anxious to extend his excursions beyond the limits of Europe, but promises made to his parents prevented their immediate execution. In 1827 he was deprived of the care of a mother's watchfulness, and in the year following, an opportunity

having presented itself, through Consul Kustaer, he availed himself of it, and became supercargo of a flock of Merino sheep, which were sent to the United States on speculation; and shortly after his arrival received an appointment in a counting-house in Virginia. In that country, Nature displaying some of the richness and luxuriance of the tropics, did not fail to exercise more influence than the counter and numbers; and it will yet be in the remembrance of many of Richmond's inhabitants, that, loaded with plants, he often hurried through the streets to escape attention, and secure his treasures before his employer should demand his services. In November 1829 he again changed his residence and embarked from New York for St. Thomas's; before leaving the United States he had entered into commercial speculations which were continued some time after his arrival in St. Thomas, but as might have been expected, they only brought him severe losses. During the unfortunate fire which broke out in the town of St. Thomas in December 1830, he lost not only all the books and vouchers connected with his commercial enterprises, but his personal property and library were nearly entirely consumed. This confirmed his dislike for a commercial life, and from the period of this event he may be considered as devoting himself exclusively to the study of botany and natural history.

Schomburgk, with more leisure at command, now visited Puerto Rico and many of the neighbouring

islands, and made the acquaintance of Dr. Donovan, then president of Tortola, who being himself a scientific man and a botanist, invited him to make his house his head-quarters, and gave every facility in his power to forward his pursuits. In the course of these excursions, Anegada was also visited, the most northern of that group of islands which are known under the name of the Virgin Isles, and the most dangerous to navigators on accouut of its low situation and extensive coral reefs, which extend many miles in a south-eastern direction. During the short time he remained in Anegada, he witnessed the total wreck of three vessels, and all the accompanying misery; but the most vivid impression was left by the intense human suffering connected with the loss of the Restanadora, a Spanish slaver, loaded with one hundred and thirty-five Africans, the ablest of whom, chained in the hold when she struck, perished most miserably, and he relates the horror with which he afterwards visited the spot where the ill-fated vessel had sunk and observed the numerous sharks, rockfish, and baracuta which the clear and calm sea allowed distinctly to be observed, diving in the hold where the human carcases were still partly chained, to tear their share from the bodies of the unfortunate Africans; and here arose his first desire to contribute, if possible, his share to the prevention of such an occurrence. This turned his thoughts to a new department of science, and on inspecting the existing charts of that dangerous island, he did not consider them

correct, but thought that some other cause must also operate in the frequent shipwrecks. Having previously assisted in surveying, he applied himself to gain a more complete knowledge of astronomical instruments, and having made the acquaintance of the captain, at that time commanding the artillery in the Danish island of St. Thomas, and of the harbour-master, in whom he found well-instructed men, he procured some of the most necessary instruments from their valuable collections and returned to Anegada. Here, for three months, at his own expense, and unassisted by a scientific companion, he executed the survey of that island and its reefs, and ascertained the existence of a strong current, by which the vessels bound from Europe and America to the Virgin Islands were carried further N. N. W. than they were aware of. * Many of the inhabitants of Anegada, who made their livelihood at the cost of the unfortunate vessels which stranded on their reefs, and who shared in all the evil propensities of wreckers, put every obstacle in Mr. Schomburgk's way to prevent the execution of his survey; and one of them went even so far as to rush with a drawn knife upon him to take his life, an attempt which very likely would have been successful, had it not been for the interference of byestanders. The execution of justice was at that time so restricted in those islands, that although the individual was

* Journal of the Royal Geographical Society of London, vol. ii. p. 166, vol. v. p. 23.

found guilty by the grand jury, the warrant for his arrest could not be put in force.

Mr. Schomburgk became at this time aware that a society for promoting geographical knowledge had recently been instituted in London; and while he sent his first Hydrographical Survey to the Admiralty, he at the same time forwarded a description of Anegada to the Royal Geographical Society, which was published in their second volume,* but being entirely unknown to the Hydrographical Office of the Admiralty, one of His Majesty's surveying vessels, then on the West India station, received orders to test Mr. Schomburgk's work, and the commander of that vessel having reported favourably, the chart was published.†

The inhabitants of Tortola, a small mountainous island, with little or no resources, complained that the Danish island of St. Thomas was appointed as the station of the West India packets, while they as British subjects thought they were more entitled to the profits which such a station would bring to them; while, on the other hand, those of St. Thomas, anxious to preserve the stay of the English packets in their harbour, deteriorated that of Tortola, which, besides, laboured under the disadvantage of not being surveyed. Although the survey of Anegada had been executed at his expense, without receiving even a reimbursement for his out-

* Remarks on Anegada, vol. ii. p. 152.

† Anegada Island and Reef, by Robert Schomburgk, Hydrographical Office, 1832.

lays, Mr. Schomburgk offered his services to the Tortolians to survey that harbour and the roadstead, if they would bear his actual expenses. There being no Legislative Assembly then sitting, the speaker and other influential members promised this; and in order to incur no further delay, the survey was commenced and finished and the materials forwarded to the Hydrographical Office, which was tested in a manner similar to that of his survey of Anegada, and was subsequently published by the Admiralty. *

Towards the close of the year 1834, the Council of the Royal Geographical Society of London, desirous to promote the noble science for which they were united,—to stimulate discovery,—to assist in the exploring of regions known scarcely beyond the darkness of savage life,—and thus to extend the sphere of useful knowledge, of commerce, the arts of peace and humanity,—resolved on sending out an expedition to the interior of British Guiana, for the twofold purpose of investigating thoroughly the physical and astronomical geography of that almost endless tract of country, and of connecting the line of positions which might be ascertained with those of the Baron Humboldt on the Upper Orinoco. The British Government, not less desirous that the resources of the colonies should be

* Tortola Road and Harbour, by Robert H. Schomburgk, Hydrographical Office, 1836.—A third chart, Mouth of the River Corentyn, by the same author, was published in 1837, in the same office.

properly developed, on learning of the enterprise, were pleased to stamp it with their warm approbation and extend to it their patronage; and Mr. Schomburgk received the appointment, with orders to proceed to Demerara, where he was to receive a certain amount of funds, it being understood that the sale of his zoological and botanical collections were to contribute to defray the expenses incurred during his voyage of discovery. *

Nothing could have been more gratifying to the feelings of this gentleman than such an appointment; and he accepted the charge with alacrity, as he clearly foresaw that it would enable him to become acquainted with the interior of a fine country, of which Europeans had hitherto obtained but a very scanty knowledge. †

Mr. Schomburgk left Georgetown on the 21st of Sept. 1835, and, coasting round the peninsula of low alluvial land, reached the entrance of the Essequibo, which discharges itself into the sea by an outlet nearly twenty miles wide ‡ from shore to shore, but separated into four channels, of which the chief, called Wakenaam, is seven miles in length.

* The instructions which were sent out are printed in the Journal of the Royal Geographical Society of London, vol. vi. page 7.

† Mr. Schomburgk has been so kind as to make the following extracts, detailing the principal facts of the Guiana expedition, expressly for our use.—Ed.

‡ According to others, only fifteen.

This river runs in a direction north and south to a distance of about thirty-five miles, forming its first or *sea reach* with an average breadth of eight miles. Indeed, its appearance here is rather that of a lake than of a river, being studded with islands and bounded on either bank by a dense and apparently impenetrable forest, rich in the exuberant verdure and wildness of a virgin soil and tropical sun; while the blue mountains, far in the distant south, are occasionally seen peeping out of the horizon.

Amongst others may be noticed Hog Island and Fort Island. The latter is the more remarkable, as having been once the seat of government and the centre of all the trade of the colony under the Dutch. It is now still, lifeless and deserted; the only inhabitants to be met with are a few coloured people, who have built their mud hovels upon the ruins of the former capital of Guiana.

Further up, at twenty-five miles from the sea, the traveller will arrive at Itaka, where the granitic chain commences: the rocks here are probably gneiss, and project some distance into the river, forming a dangerous ledge, which is covered at high tide. Off Ampa, a small settlement about six miles further, are two curious sets of rocks, called the "Three Brothers" and "Three Sisters," one of which, with a little imagination, resembles a gigantic head,—a frightful source of superstition alike to the uneducated colonist and the ignorant Indian. Four miles hence, the united streams of

the Mazaruni and the Cuyuni disembogue themselves into the Essequibo, by a mouth fully a mile in breadth. On the south point of their confluence is the missionary station of Barteka.

Mr. Schomburgk here left the main stream, and sailed up the Cuyuni five miles to the Post, or station of the Post-holder,—a most commanding situation, whence may be seen the accumulated volume of the Essequibo, the Cuyuni, and Mazaruni, as it rolls onward into the Atlantic. The Post is built on a mass of granite, fifty feet above the water. The object of these establishments is to protect and maintain peace amongst the native tribes, as well as to watch strangers passing up and down.

Our traveller remained at this station some days, engaging Indian rowers and other attendants to accompany him as he advanced through the unknown regions of the interior. He availed himself of this interval to ascend the Cuyuni. This, he was told, continues uninterrupted almost to its source, where, being separated by only a short portage from the Carony, the Indians are in the habit of crossing to that river, and descending it and ascending the Orinoco, they maintain an inland communication even with Angostura. Along its banks reside many Africans, who, having intermarried with the Indians, have adopted their manners and customs. There are also one or two Carib settlements here; these Indians differ in some respects from the Arowaâks of the coast, they do not

tattoo, but stain their bodies with the *rucu*,—the famous arnatto dye of commerce. The females fix a tight bandage round the leg, below the joint of the knee and above the ankle, thus giving an unnatural protuberance to the calf. They perforate the lobes of their ears with bamboo, and their under-lip with a row of pins, by which they establish, as it were, a *chevaux-de-frise*, or effectual barrier to any improper freedom. The natural beauty of a Carib woman is not, as may be supposed, at all heightened by such contrivances.

On the 1st October the ascent of the Essequibo was resumed; the party, which consisted of three Europeans, namely, Lieutenant Haining of the 65th regiment, Mr. Robert Brotherson, and himself,—nine Negroes, and five Caribs, three Macusis, and two Accawais,—now occupied three corials.

Continuing on south and south-east, and passing Osterbecke Point, and next Cumaka Serima, which is the last settlement below the falls, they arrived at Aritaka, in latitude 6 deg. 11 min. north, where they encountered the first rapids which impede the navigation of this river. The most considerable of the series is called Itaballi; the last, Ahara. South of the rapids, numerous sand-banks are seen rising out of the surface of the water, which serve as a depository for the eggs of the *guana* (*Lacerta guana*), esteemed a great delicacy. The Indians of the party showed great dexterity in securing them; in a very short time they took some hundreds, besides capturing several of the guanas.

The banks of the Essequibo are here from ten to twelve feet high, composed of clay and sand, with a slight covering of mould, and possess a luxuriant vegetation; behind them extends generally a natural ditch, formed by the receding waters after the annual inundation.

At Hubucuru, Mr. Schomburgk measured a base line which gave as the breadth of the river 1520 yards, and the height of the Arissaro hills, bearing south-east at a distance of eleven miles, 640 feet. On the eastern bank a creek falls in, called Mucumucu, whence an Indian path leads to the Demerara river, of only one day's journey. Indeed, by means of two streamlets, tributaries of the Demerara, it is possible that a regular water communication may be maintained with the Essequibo, thus avoiding the dangerous rapids of Itaballi. Should colonization extend to the interior, it is to be hoped that a point of such importance will not be overlooked.

The forest in these parts reigns triumphant. All traces of civilization have been left far behind; above, around, is one dense mass of foliage. Pre-eminently over all towers the majestic *mora* (*Mora excelsa*, Bentham), with its dark-leaved branches,—one of the most gigantic trees of the western hemisphere, and equal if not superior to British oak for ship-building. The scarcely less stately and equally useful *saouari* (*Pekea tuberculosa*, Aub.), which bears a rich and nutritious nut; the *siriaballi*, excellent for planking vessels and resisting the attack of worms; some species of *wallaba*; the *trumpet-*

tree; the *water-guava*, which replaces the mangrove of the sea-shore, and yields an aromatic leaf of great use in dysentery; and many other trees and plants yet unknown or undescribed. Lianas, or *bush-ropes* of the colonists, are seen at times twisted like a cork-screw around the loftiest trees, and at others intertwined like the strands of a cable, then drooping to the ground and again taking root, and thus, as it were, securely anchoring the tree against the fury of the sweeping blast; the wild fig-tree occasionally taking root in the topmost branches of the mora, and deriving nourishment from its sap; and this, again, overrun by varieties of the climbing vine: the whole rendered bright and gay by the brilliant blossoms of numerous bignonias, while the *haiowa* or incense-tree (*Amyris ambrosiaca*, Willd.) perfumes the forest with its salutiferous resin.

The travellers have now arrived at the Arissaro hills. On first descrying them, the Carib Indians had to undergo an initiatory process; they squeezed tobacco-juice into their eyes, which painful application they considered necessary in order that they might live to return. At sixteen miles farther south, the Yaia hills, about two hundred feet high, and upon the eastern bank, cause the river to assume a course due north, which it maintains for sixty miles. Still farther are the Oumai hills, of a similar elevation, and forming the greatest angle in its course. Here the *laná* (*Genipa Americana*) grows abundantly, from the fruit of which the Indians procure a blue dye to paint their faces.

For the last few miles the granitic ledges have presented a glazed coating, probably from black oxide of manganese, and the dykes, which here cross the river, had at a short distance the appearance of a dry stone wall. They form rapids at Cumaka and Akramalalli, which are not passable but with great difficulty; for though the fall of water be trifling, the sharp edges of the rocks very much endanger the canoes which have to be hauled over them. But it is at Waraputa where these rapids are most serious, and it was some hours before our travellers got fairly over them. Rocks broken up in the greatest confusion, forming numerous channels, through which the water is seen tumbling and rushing in every direction,—here an impetuous cataract, there a gliding cascade,—accompanied by a loud dunning noise, combine to constitute a picture at once sublime and awful; filling the mind of the beholder with dread and admiration of these stupendous and magnificent works of his Creator. The fish called *pacu* is abundant here, frequenting the falls to feed on the *weira* and various other species of *lacis*.

The most remarkable mountains next passed were the Taquiari offset of the chain of Twasinki. The former name is derived from a pile of large granite boulders, so placed upon the mountain as to resemble a water-jar: hence, too, called *Cumuti* by the Arawaaks. Much superstition was attached to them, and those who had not seen them before were obliged to drink lime-juice, and to have

tobacco-water squeezed into their eyes, to avert the evil spirit!

Against some rocks in the river were found the remains of a corial, which, on its descent, badly managed, must have been wrecked; or, while ascending, the rope might have given way, when destruction is almost inevitable. Broken arrows, bows, and other Indian implements scattered near afforded a proof that the unfortunate occupants had lost their lives.

Heavy showers falling one evening, the lodgings of the party were rendered exceedingly uncomfortable. The Indians, at all events, found it so; and, according to their superstitious belief, the chief commenced to *piai* the rain away. A quick movement with the hands, and a sound muttered between the teeth, formed the charm. But the spirit was implacable; and, after vain attempts, the chief was the first to seek a shelter. Then a tremendous crash startled all; the rain had softened the earth, and one of the large trees which stood near the bank, partly undermined by the river, had given way and fallen into the water; before it reached the surface, the bearing down of all the minor trees and branches was heard, then the plunge, and lastly the cry of startled maccaws, parrots, and monkeys was a noise of unknown sounds; a moment after, and everything was hushed in silence, save the monotonous noise of the falling rain.

In this neighbourhood grow a number of graceful little palms of the genus *Bactris*, a species allied to

which is used by the Macusis for the manufacture of the celebrated blow-pipe, through which the arrows dipped in *worary* poison are blown. Here is also a palm called *kiragha*, used for fencing in the mouths of inlets to prevent the escape of fish when the water has been poisoned.

After encountering various obstacles from the falls and islands with which this mighty river abounds, the exploring party at length reached the mouth of the Rupununi, the chief tributary of the Essequibo; having been three weeks toiling upwards, over a distance of at least two hundred and forty geographical miles from the sea. The waters of the Rupununi are of a turbid yellow, whilst those of the Essequibo are blackish, and the line of division is clearly perceptible.

The Rupununi for the first ten miles holds a westerly direction, curving to the southward, is about two hundred yards wide, and in the dry season seldom more than three feet deep. The banks are abrupt, about six feet high, and exhibit a far less luxuriant vegetation than the Essequibo; the water-guava with its snow-white blossoms, and clusters of the *sawarai* palm, were the most conspicuous. For several days the caymans had disported themselves quite unceremoniously, and one sixteen feet long came close to the bank to reconnoitre the party. He was saluted with balls, which, however, took no effect; and he only plunged and re-appeared, as if determined to watch their movements.

Our travellers, after passing a deserted Indian settlement, arrived, some miles farther, at the rivulet Annai, leading to a village of the Macusi Indians. Hither they transported their baggage and collections; and, having satisfied the principal persons of the tribe with a few presents, took up their abode in a hut, which, however humble, was luxury itself when compared with the cramped-up position they were obliged to keep in their corials, and to the privations and toils of their long and difficult wayfaring.

A month had passed away at Annai, during which their health was recruited, abundant information obtained from the natives, and specimens of natural history collected, when they proceeded on their ascent of the Rupununi. Vestiges of the last inundation of this river were observable wherever it made a turn; and in many places trees broken down by the current, or withered away, made its banks appear as though a tropical hurricane had swept over the country. Leaving several groups of mountains, they debarked at an inlet, and rode on horseback to Pirara, a village of fourteen houses and from eighty to a hundred inhabitants, remarkable as lying on the border of the once famed Lake Amucu. Next morning they returned to the corials, and wended their way up the river; extensive savannahs bounded its banks on either side, while beyond these, to the eastward, could occasionally be seen patches of gently undulating and well-wooded ground.

They now approached the mountain-range of Conocor or Canuku, through which the Rupununi has forced a passage, carrying a width of about a hundred and thirty yards. Some of these mountains rise to the height of from two thousand to two thousand five hundred feet. They are of granite, well covered with wood, and are inhabited by a numerous tribe of Indians called Wapisianas or Mapeshanas. Near a village of these Indians our travellers with their attendants encamped. On landing, amidst a very heavy rain, all hands were set to work building temporary huts. The axe, the hatchet, and cutlass were heard resounding in all directions, and many a young tree or graceful palm was speedily laid low. The rain descended in torrents for several days. To add to the annoyance, Mr. Schomburgk was suffering from a severe tertian fever; his situation, therefore, in a hut covered only by a sort of wax cloth, open to the rain from all sides, with the thermometer at 78 deg. Fahrenheit at noon, was certainly not to be envied. Nevertheless, he did not delay setting off, taking with him in a small corial only four Indians and their chief, Jacobus.

The state of the river soon obliged him to make a stoppage; it was now only an insignificant mountain stream, beset by granitic rocks and sand-banks. He landed, therefore; but it was only to encounter a new, and, if possible, more provoking annoyance: a small species of sand-fly, called by the Indians *mapire*, which were in thousands over the river,

alighted on the face and hands of every one of the party, drawing blood, and leaving a spot which remained for weeks. The poor Indians, uncovered as they were, presented a pitiful appearance, from the stings and swellings which followed.

Next morning they wandered over the savannahs, and visited a small settlement of Wapisianas, in order to the due procuring of provender. It consisted only of a dome-shaped hut and two smaller open ones. A number of Wapisianas had assembled to have a *paiwori* feast. They were finely formed people, and taller than any Indians before observed. The men all came forward and greeted their visitors in the manner of the Macusis, by waving their hands before their faces; afterwards they retired, and a lively conversation and loud laughter ensued among them. On looking for a moment into one of the open houses, women and children were seen busily employed in baking fresh *cassada* bread for the feast. What an uproar when Mr. Schomburgk made his appearance! The children ran away screeching, fowls and parrots followed, and the dogs set up a hideous yell, exhibiting every intention to attack him.

When their excitement at this unlooked-for visit had in some measure subsided, the guests began to assemble for the feast. Hammocks were slung around the circular house, and the implements of the kitchen and the chase ranged against the walls; the middle being occupied by a wooden trough, capable of holding sixty gallons, filled with the

paiwori or intoxicating drink. Fever having forced him to keep his hammock, Mr. Schomburgk had a good opportunity to watch their proceedings. The guests were attended by companions highly painted and ornamented for the occasion. On a signal being given by the host or one of the guests, the calabash was filled and handed to the person who desired it, then passed to his neighbour, and so on until it had made the round. But little rest was granted to the bowl; and, before many hours had elapsed, the large trough was emptied and again filled from immense earthen vessels which had been kept in reserve. Meanwhile the conversation became most violent. Feats of valour, encounters with jaguars and other wild beasts, formed the prominent subjects; but, ere the second trough was emptied, one tongue after another had become silent, and sickness appeared to have taken possession of them all. Thus is the beverage, already unclean in its preparation, misused, and man degraded!

The Indians have been accused of want of affection for their children. Mr. Schomburgk declares he has seen frequent instances to the contrary. A Wapisiana returned from a few days' journey, when his children flocked around him, hung about his neck, and put a thousand questions to him; very likely about his success, what he had brought them, &c. He took some cashew-nuts out of his *queck*, or basket, which caused them great joy, though they might have got as good a few yards off. His

wife brought him the youngest child, a baby; he caressed it with the same fondness a civilized being would do. They show, too, more attention to their wives than is commonly supposed. This is most remarkable amongst the Caribs, who seem to regard their women rather as companions than slaves. They, indeed, must work hard; the men clear the ground, and the women cultivate and bring in the crop; but they are by no means the low slaves and drudges they have been represented. Their greatest failing, and that which unfortunately appears to prevail amongst all the Indian tribes, is the neglect of aged persons and the sick, who are too often stowed away in a small corner of the house, neglected and left to themselves.

Accompanied by a numerous body of Wapisianas, the expedition proceeded along the foot of the mountain chain, following each other in what is called "Indian file," that is, one abreast, through a path of not more than six or eight inches wide. This, however, is immaterial to the Indian; his peculiar method of walking, with the toes inward, enabling him to go over the smallest path with comfort, while another could not do it but with extreme inconvenience.

Having passed the Saeraerie mountains on the river's western shore, crossed the savannahs, and waded through several Ita swamps, they reached the Cartatan or Corona, the largest fall of the Rupununi. The river was very low; the fall had lost its grandeur, and was not to be compared with any

on the Essequibo. Far in the south-eastern horizon, at the distance of about sixty miles, rose the Carawamee mountains, stretching east and west, and probably the Sierra Acaray, or Tumu-curaque of our maps. From one of these, according to the natives, the Rupununi has its source; soon after, receiving from the eastward a tributary, it forms a large Ita swamp, then assumes a north-west course with no interruption till it meets the Paha-eteeyan or Cassada-bread hills on its western bank, when it forces itself through a bed of stratified granite, spreads into many channels over a bed about four hundred yards wide, again narrows, and rushing over a granitic dyke, forms the Corona or upper fall of the Rupununi. The Rupununi has its sources in the savannahs, and, allowing for windings, is about two hundred and twenty miles long.

It had been intended to explore the Rupununi to its sources, but the want of water, a severe intermittent fever, and the approaching rainy season would not allow it. Mr. Schomburgk, therefore, after completing his observations, returned to the northward, and, desirous of obtaining a specimen of the plant which furnishes the famous *urari* or *wourali* poison, bent his steps over pathless savannahs, until after a weary march of upwards of eight hours, he arrived at a settlement of Wapisianas. Here he found some sugar-canes, bananas, plantains, and cotton-trees in perfection. Efforts were made to dissuade him from his journey, but to no purpose; he started next day along a difficult path, and reached a glen near

a spring, when one of the guides, going up to a ligneous twiner which wound itself snake-like round one of the trees, called out " Ourali !" the name of the plant in question in the Wapisiana tongue. This is a ligneous vine; its stem, often more than three inches thick, and crooked; its bark rough, and of a grey colour; the leaves dark green, opposite, ovate, acute, five-nerved, veined, and hirsute; young branches also hirsute; fruit of the size of a large apple, round, smooth, bluish-green; seeds imbedded in a pulp, and consisting chiefly of a gummy matter which is intensely bitter. It grows only in one or two places in Guiana, which are resorted to by Indians from all directions, and often from great distances. It has been ascertained to be a species of *Strychnos*, and has been named *Strychnos toxifera*, Schomb.

Having descended to the savannahs, and following the course of the Rupununi, the party returned to Pirara. In the month of April the savannahs on this side of the Rupununi are completely inundated; the waters of two rivers belonging to two distinct systems, swollen by the rains, are said by the Indians to commingle at that period, and the deluge thus realized has doubtless given rise to the fable of the Lake Paraima.

Many of the savannahs are covered with the fabrics of a species of *termites;* these are pyramidal, from five to ten feet high, and formed of ochreous clay. Another species of this insect encrusted the trunks of trees from the base to the

branches, giving them an appearance as if they were fringed.

The party retraced their steps to Curassawaka, a settlement of the chief Irai-i, or Jacobus, where they remained during the rest of their stay on the Rupununi, making astronomical observations, and collecting information as to the features and natural productions of the country. As it was long since sugar had sweetened their coffee, they resolved to build an Indian sugar-mill, and to buy from a Macusi woman the canes then on her grounds. By the mechanical skill of one of the party, a mill was soon erected; the Indians were employed in pressing out the juice of the cane, which was converted into syrup, and next morning coffee was sweetened! Trifling as this circumstance might appear, it was nevertheless a novelty; and a most welcome one, after the privations of the wilderness.

But novelty lasts not long. The stay at Curassawaka was becoming irksome; legions of *chigoes* and their next of kin, fleas, had taken possession of the travellers' hut; the former, in particular, not only penetrated under the nails of their feet, but also attacked their hands, burying themselves under the finger-nails. Add to this, the rainy season was approaching. It was thought desirable, therefore, to depart without further loss of time, and return to Georgetown; so, after a stay of about a month in these once comfortable quarters, the expedition, numbering now upwards of eighty persons (for the Indian will always travel in company when he

can), embarked again in their corials, and proceeded on the descent of the Rupununi to its junction with the Essequibo.

Determined, however, to trace, if possible, the latter river as far as the advanced season permitted it, Mr. Schomburgk and his companions turned sharply round in order to ascend it. They pursued an almost easterly course for eight miles, and observed a river flowing in from the south-west, the largest tributary of the Essequibo since they had left the Rupununi. The Indians were utterly unacquainted with its existence or its name. Our traveller, therefore, called it Smyth's River, in honour of Sir James Carmichael Smyth, the then governor of British Guiana. The banks had still the same luxuriant appearance as on the lower Essequibo; while numerous monkeys jumping from branch to branch,—the female, and sometimes the male, carrying the young ones upon the back,—contributed much to enliven the scene. Rapids subsequently became frequent; and at length appeared the great cataract, which the Indians agreed in declaring no white man had ever before reached. Numerous conical hills of granitic structure, covered with verdure, narrowed the river to within fifty yards, where the whole body of water dashed down a precipice of fourteen feet, then foamed over a rugged bed of rocks for about twenty yards, and again precipitated itself to a depth of ten feet into the basin below; forming a picturesque and noble scene. This was christened, with all the established

forms, by the name of King William's Cataract, in honour of his late majesty William IV., the first patron of the Geographical Society.

Not venturing farther, and having accomplished all that was in their power, they buried a bottle in the sand, recording the date of their visit, and bent their course down the stream, stopping at Primoss in order to examine a path that was said to lead to the rivers Demerara and Corentyn. Then passing the Rupununi, and arriving at the mouth of the Siparuni, they proceeded to some distance up the latter, as well as its affluent the Burro-burro, employing the interval in catching fish; for the rain, which now descended in torrents, entirely prevented them from hunting, and they had only cassada-bread, on which they subsisted from the period when they passed the falls of Rappu till their arrival among the coloured people of the Essequibo.

The acuteness of the Indians in discovering the guana was surprising. While following the course of the river, the current often carried the party with the greatest swiftness; still, and though hid partly among the thick foliage of the bushes, the Caribbees discovered the poor animals feeding upon the leaves of a favourite tree, or lurking for insects. The discovery of a gold mine could not have given the crew more joy; the bow-string was quickly fastened, and the arrow, properly directed, seldom missed its aim.

While thus on their return, one evening, observing some moving objects on a sand-beach, every

one in the boat was of opinion that they were men; and, being dressed in white, it was concluded they were coloured people from the Essequibo on a fishing excursion. Information had been received that an epidemic had broken out in the colony, and they were therefore doubly anxious. The crew seemed to understand this feeling, making the stroke of the paddle resound with double swiftness. The beach was approached, when, lo! instead of human creatures, three *jabirus* (*Mycteria Americana*) were seen pacing leisurely up and down! These large birds, however, took to their wings before a gun could be brought to bear upon them, and thus another disappointment was added. Their measured step and upright bearing had frequently amused a military companion, who could not help being reminded of the parade, and even, while passing the beach, gave these feathered recruits the word of command; so that, among the party, they ever after went by the name of his recruits.

Mr. Schomburgk, in passing a dangerous fall called Apou-coyahan, met with a very narrow escape; and he was so unfortunate as to lose one of the corials, with a numerous collection of geological and other specimens,—a contingency which too frequently falls to the lot of the traveller. At length, on the 28th March, 1836, he arrived with his companions at Georgetown; and being received in the most obliging manner by the governor, and finding the most lively interest displayed in his exertions throughout the colony, was soon induced

to forget all that he had suffered during the previous six months.

ASCENT OF THE RIVER CORENTYN.

Having explored the river Essequibo to three and a quarter degrees north, and the river Rupununi to two and a half degrees north latitude, Mr. Schomburgk now considered it desirable to make choice of some other of the great rivers of Guiana; hoping that, by pursuing the stream towards its source, he might be enabled to penetrate into the interior towards the Sierra Acarai, and at the same time investigate the capabilities of the adjacent country for colonization. For this purpose, therefore, the Corentyn was selected; the more especially as the reports heretofore obtained from those who had visited this river were but meagre and unsatisfactory.

On the 2d September, 1836, he quitted Demerara for Berbice, accompanied by an artist and an ornithologist whom he had engaged for the occasion, and three volunteers, namely, Lieut. Losack of the 69th regiment, Mr. Reiss, and Mr. Cameron; and having entered the Corentyn, pursued his way up this river, for about forty miles, to the Post of Oreala. The banks of the river thus far are generally low, but fertile, and well calculated for cultivation. At present they are almost uninhabited; whole tracts remain the undisputed haunt of the jaguar and the deer.

There are several settlements of Indians here,

under the care of the Postholder. The number of individuals may be six hundred and fifty; namely, Arawaaks, three hundred; Warraus, two hundred and fifty; and Caribs, one hundred. Like the generality of the Indians, they cultivate provisions and live by hunting and fishing, while the chief part of their time is spent in the hammock. It is only lately they have commenced assisting woodcutters to fell timber or to split staves, for which they receive monthly wages or a stipulated sum.

Three days' journey from the Post brought the travellers to the second range of clay hills, called by the natives *Sipruta*. The geological formation of these hills had induced Mr. Schomburgk to suppose that they might contain coal; the beds are in alternate layers, consisting of clay, shale, and sand; and there are portions of a bituminous substance scattered upon the sand-banks. Should his conjecture turn out to be correct, a most valuable discovery will have been secured to the colony.

Continuing onward till arrived at the mouth of the Cabalaba, he ascended that river as far as it was navigable. Numerous shrubs of the wild arnatto, or *pisucou*, margined its banks, and the splendid flowers of the *Cassia calyantha* towered over them. Hills sixty feet high occur about twelve miles up, and erratic blocks become frequent.

A few days after, a remarkable rock was passed, called by the Caribs *Timehri*. It was distinguished not only from its size, but especially from a number of gigantic figures engraved on it, one of which

measured more than ten feet. This, it is believed, is the most eastern spot in this part of South America in which these sculptured rocks have been seen.

Some miles higher up, they encountered a great obstacle to their further advancement, in a series of formidable cataracts. The Corentyn was now broken up into torrents, and it was found necessary to reconnoitre. The canoe was hauled over a bed of rocks, and the travellers crossed a rapid in an oblique direction, and soon stood before a pile of rocks which, when the river is full, are the bed of a cataract; at present only a small stream rippled over their blackened surface. They had hoped at first that this place would have afforded a possibility of drawing the corials over, but their hopes fell with every step that they advanced; enormous rocks heaped together, opposed even their further progress on foot; at times immense chasms yawned beneath, and at others they had to wade through a stream which pushed its winding way through rocks, and disappeared as if by magic, until the subterraneous noise told them it was rolling below their feet, and made its re-appearance where it was least to be expected, leaving them to wonder whence it came. Many of the rocks were clothed with plants; and on the right was heard the thundering noise of a cataract, over which a dense mist hovered. Thousands of swallows were skimming through this cloud, rising and falling as if delighted with the constant moisture from the spray.

Our adventurous travellers visited the cataract

afterwards, which in grandeur surpassed any they had ever before seen in Guiana. A branch of the river near, divided itself into two channels forming another fall. The former, which is the most western, was called after Sir Carmichael Smyth; on the latter was bestowed the name of Sir John Barrow, as president of the Royal Geographical Society.

Finding it impossible to cross these rocks, and having tried in vain to cut a path through the forest, his companions began to urge Mr. Schomburgk to return; to which, with a heavy heart, he consented, taking care first to survey the lower basin, and extend his operations to that point where the river meets the first impediments.

Though the expedition up the Corentyn failed of its professed object, yet the knowledge acquired of this river, and the discovery of the possibility of Guiana possessing coal mines, are of some importance. Represented, too, on all former maps, as one of inferior size, he had found it almost equal to the Essequibo; while its course, as usually laid down from five degrees of north latitude, is now shown to be the reverse of the truth; and where it is indicated to have its sources, it is found nine hundred yards wide! Indeed, every circumstance considered, it may be concluded that the three chief rivers of British Guiana have their sources from the same chain of mountains within a short distance of each other; or, possibly, that they flow from a

lake, of which some vague information from the Indians had been received.

The ascent of the river Berbice was next to be attempted, and on the 25th November, 1836, the expedition quitted New Amsterdam with a flowing tide; and paddling rapidly up the sea-reach of the river Berbice, and passing the site of Fort Nassau, the former capital of the colony, they arrived, in the course of fifteen miles farther, at Wickie, situate on the western bank at the junction of a river of the same name.

Immediately at the back of Wickie is a marsh, then sand-hills, which separate it from the savannah. Wickie was then the residence of Mr. M'Cullum, who had a very extensive wood-cutting establishment, and employed often two hundred Indians and fifty negroes in cutting and squaring timber; he bore testimony to the industry and perseverance of the former at their work, and had a high opinion of the value of an Indian under proper treatment.

At two miles' distance from the river, near Moracco, commence savannahs which extend towards the river Demerara. They are said to be inhabited by Indian tribes who never visit the colonists; obtaining shot, knives, alempores, &c. by bartering hammocks, spun-cotton, and crab-oil with those Indians who keep up a communication with the coast. These Savannah Indians are supposed to number five hundred, and are located in upwards of thirty settlements.

The influence of the tide was not felt beyond a hundred and sixty-five miles from the sea, measured along the windings of the river; it was but trifling where the expedition encamped, near a settlement of the Waceawa Indians. Further south, a ledge of granitic rocks was observed, on which were a number of Indian picture-writings resembling those at Waraputa on the Essequibo; but neither so regular nor on so large a scale as those on the river Cabalaba and the Corentyn.

The river became now so much impeded by cataracts and rapids, that it took frequently two hours to travel over a distance of only a hundred yards; and the combined crews had great difficulty in drawing the corials over them. As they advanced, the caymans or large alligators became very numerous. The tenacity of life which these reptiles possess is extraordinary. One was fired at floating, and the ball took off the end of the snout; it received another immediately afterwards in the hinder part of the skull, which appeared to have taken effect; still, the Indians were not sparing in their blows and when there was not much likelihood of its possessing a spark of life, it was deposited in the bow of one of the corials. While the corial was drawn across the rapids, two of the Arawaaks got courage, and took it up in order to lay it in a more convenient place; they had just effected this, when at one bound it jumped out into the river and disappeared. The Indians looked quite stupified, and

never afterwards could be persuaded to touch a cayman. Another of these animals had a piece three inches long cut out of its windpipe, and an hour after was still alive; nor was it until a strong knife had been driven by main force into its brain, that it expired.

Christmas day was spent at the cataracts; and though but a few of the Indians were aware of the occasion and origin of this joyful day, and equally were unable to understand what they were told of the birth and atonement of our blessed Saviour, yet they participated in the better fare which the party enjoyed; and as they could not learn whether these falls had any name, the proposal that they should be called "Christmas Cataracts" was gladly adopted.

The expedition continued on its progress but slowly; the river narrowed considerably, and numerous trees which, from age or the undermining effects of the current, had fallen across, disputed its advance. They were beginning to give themselves up to despondency, when they arrived at a point where the river expanded and formed on its eastern bank a smooth basin, on the southern part of which some object attracted attention. No idea could be formed what it might be, and the crew were hurried to increase the rate of their paddling; in a short time they were opposite the object of their curiosity—a vegetable wonder! All calamities were forgotten; Mr. Schomburgk felt as

a botanist, and felt himself rewarded. A gigantic leaf, from five to six feet in diameter, salver-shaped, with a broad rim of light green above and a vivid crimson below, rested upon the water; quite in character with the wonderful leaf was the luxuriant flower, consisting of many hundred petals, passing in alternate tints from pure white to rose and pink. But it is unnecessary here to repeat the description of this wonderful plant, of which the discoverer has published a drawing, and obtained Her Majesty's gracious consent that it should be called *Victoria Regia*.

The difficulties of the travellers again appeared to increase with every hour. The river became quite narrow, winding its course through a wilderness, margined by prickly palms. They were consequently obliged to man the corials with some of the ablest men, with cutlasses and axes in their hands, to clear the greater obstacles out of the way; while they themselves followed with the other corials, which were forced forward by long poles. Frequently, too, they were molested by ants, centipedes, scorpions, or spiders, which secreted themselves in the rubbish left on the bushes by the last inundations, and inflicted the severest bites; or they received a brush over the face and hands by one of the prickly palm-leaves, which never failed to leave marks of its passage. Add to this, they could not find a dry spot in which to sling their hammocks, and they began to entertain suspicions of the fidelity of the crew (arising, it was afterwards ascertained,

from their dislike to proceed further on what appeared so unprofitable a journey), which circumstances, as may be supposed, were not calculated to soften their disagreeable situation. Nevertheless, they were still bent on pushing on as far as practicable.

Three days had thus passed away, when it was ascertained by an astronomical observation that they had arrived at a parallel with the junction of the Essequibo and the Rupununi. The party here met by accident with the path which leads from the Corentyn to the Essequibo; and while they were encamped, the Caribs whom they had previously visited at the Corentyn arrived to pay a visit to the Macusis, not as they had first contemplated, on a slaving expedition, but merely for the purpose of bartering for dogs.

It was now resolved to cross over in a south-west direction to the Essequibo. His party consisted of himself and one of his companions (Mr. Reiss), one free coloured man, and five Indians, besides the Caribs who had arrived the previous day from the Corentyn. The path was barely twelve inches wide, and numerous trees had fallen across it. The ground for the most part preserved the same level. Here they had to ford swamps, in which the *manicole* palm grew most luxuriantly,—there, to traverse woods consisting of magnificent trees, the soil springy, and of a rich vegetable mould mixed with sand. Their line of march presented a strange sight:—Indians with baskets containing articles for barter, and large bundles of bows and arrows;

women with children, or the brats astride the husbands' shoulders, some with luggage and provisions, and the little girls, anxious to perform their part, each carried a squalling puppy in her arms; thus they trod the path in Indian file.

In three hours and a half the broad Essequibo was seen rolling before them; it was hailed as the sight of an old acquaintance, and the hut which the travellers had erected about twelve months ago at Primoss was still found standing. The result of this passage from the Berbice to the Essequibo will prove of importance to geography; the short period which is required to cross from river to river establishes undeniably, as has been justly observed before, that the course of the river Berbice must be farther to the westward than it is laid down on any of our maps; and it is probably the first time the Berbice has been ascended from its mouth to 3 deg. 55 min. north latitude. The next point of consequence is the non-existence of the river Demerara. Where he crossed, he did not observe any appearance of even a brook, between the Berbice and Essequibo, with the exception of a dry bed of a streamlet which had its outlet a little beyond his camp. In all maps the sources of the river Demerara are placed in the fourth parallel of latitude, and about thirty miles south of those of Berbice; but, in his opinion, it rises in the mountain chain between 4 deg. 30 min. and 4 deg. 40 min. north. The soil between the Berbice and Essequibo appears to be particularly calculated for the cultiva-

tion of cocoa, and the flourishing condition of the plants near Primoss may be cited as proof.

On their return to the river Berbice, they found it had fallen from eight to ten inches during the two days they had been absent. This circumstance, added to the shortness of their provisions, prevented them from crossing to the river Corentyn. They therefore pursued their return home, and in the course of four or five days arrived at the uppermost of that series of falls, which, on their ascent, for want of an Indian name, they had called the Christmas Cataracts. Great difficulty was experienced in hauling the corials over these, so as to preserve, not only life, but the property of the travellers, with the astronomical instruments and collections.

While they were encamped and occupied in transporting their corials and effects over these dangerous cataracts, in the course of conversation one day, after a scanty meal, Mr. Schomburgk was rather surprised when his companion, Mr. Reiss, indulged in a melancholy strain, saying, "He knew he should die young." Next day the head man of the crew reported that he had inspected the cataract, and thought it impossible that the corial could be lowered down by ropes, since the rocks did not afford footing to the Indians. It was therefore resolved to shoot the cataract, and the necessary arrangements were immediately made for her descent. Information being brought that the corial was just on the point of starting, he proceeded to the foot of the cataract.

When the corial hove in sight, the first object that struck his attention was Mr. Reiss, standing on one of the thwarts, when prudence would have dictated that he should sit down. From that moment to the catastrophe, not two seconds elapsed. Descending where the fall was more precipitous, the bow of the corial struck the surge, causing a violent shock, which threw Mr. Reiss off his balance; in falling, he grasped one of the iron staunchions of the awning, the little vessel was upset, and in the next moment her inmates, thirteen in number, struggling with the current, and, unable to stem it, were carried with rapidity towards the next cataract. Poor Reiss kept himself above water but a short time, sank, and re-appeared; the current of the next rapid seized him, and it is probable he came in contact with a sunken rock; he was turned completely round, and lost in the whirlpool at the foot of the rock. After a diligent search of upwards of two hours, his body was found in a direction where it was least expected, and where an under-current must have drifted it. The usual means for restoring suspended animation were resorted to, but in vain; life was extinct.

The remains of their poor companion, wrapped in a hammock as a shroud, were deposited in a sequestered spot, opposite to where he was drowned,—on a rising ground, which the water, even at its highest, does not reach. The burial service was read, and not an eye of those who called themselves Christians was dry; even the Indians, decently

apparelled, stood with downcast eyes over the grave, and a tear stole down over many a rude and hardy cheek. A small tablet, affixed to a rude pile of stones, encircled by mora-trees and palms,—the latter an emblem of the Christian faith,—now bears this inscription:—"Drowned, 12th February, 1837, Charles F. Reiss, aged twenty-two years."

With what feelings the journey was resumed, the reader may easily imagine. On returning to Wickie, the weather being more favourable than the advanced season might have led them to expect, Mr. Schomburgk resolved to undertake a tour to the river Demerara, partly by means of the Waironi, a tributary of the Berbice, and partly by land, over the savannahs. A relation of this excursion is beyond the limits of this abstract, suffice it to say that, with considerable exertions, they returned once more to Wickie, on Easter eve, and, after an absence of four months and some days, arrived at New Amsterdam. However conscious that on all occasions he had done his duty and exerted himself to the utmost, still the remembrance of the loss of one who had shared all his perils and privations, could not but throw a damp on the gratification which was naturally felt on returning from the solitudes of savage life to the abode of civilized man.

JOURNEY TO THE SOURCES OF THE ESSEQUIBO, TO FORT ST. JOAQUIM, AND TO ESMERALDA, ON THE UPPER ORINOCO.

Upwards of five months had passed away since his return from the expedition to the river Berbice, during the greater part of which Mr. Schomburgk had been laid up with a severe attack of yellow fever, when, having recovered sufficient strength and health, he determined to lose no more time in carrying out the grand objects for which he had been sent to these distant regions.

On the 12th September, 1837, therefore, in his friend Mr. Arrindell's schooner, he quitted Georgetown, and, sailing up the broad expanse of the Essequibo, soon reached Ampa, about thirty miles upon its eastern shore, where he remained a few days in order to complete his crews.

On arriving at the Cumuti or Taquiara rocks, our traveller climbed these masses of granite, which by measurement, he found to be a hundred and sixty feet in height. On one of the rocks, a Carib pointed out some Indian "picture writing," resembling the sculptures eastward of Ekaterinburg, in Siberia; and at Dighton, near the banks of the Taunton river, twelve leagues south of Boston, in North America, to which some antiquaries have ascribed a Phœnician origin. In this part of South America, Mr. Schomburgk has himself traced these inscriptions through seven hundred miles of longi-

tude and five hundred of latitude. Of many of them he fortunately possesses copies.

Continuing on, and ascending the Rupununi in a westerly direction for about thirty miles, he established his camp on its southern shore, at the mouth of the Roiwa; while he pushed on to the Macusi settlement at Annai, in order to procure a supply of cassada-bread. On his return he commenced the ascent of the Roiwa, its course for thirty miles running nearly parallel to the Essequibo, at an average distance of fifteen miles. Several rapids occur in its course. At one spot it makes an almost circular sweep of about two miles in diameter; and the natives have cut a small canal or ditch across the isthmus for about one hundred yards, and thus save the circuit in their smaller canoes. Now became visible the elevated summit of the mountain Ataraipu, one of the greatest natural wonders of Guiana. Towards this mountain the travellers proceeded, along the stream Guidaru. After two hours scrambling through woods so dense that they were at times obliged to clear their way with cutlasses, they ascended a mass of granite about four hundred feet high, when the natural pyramid of Ataraipu, or Devil's Rock, * burst on their sight, raising its bare head from an abyss of dense foliage which spread around in all directions at its foot, and standing, like a giant, "to sentinel enchanted lands." Its base is wooded for about three hundred and fifty feet high; from thence arises the mass of granite,

* See Views in Guiana, by R. Schomburgk.

devoid of all vegetation, for about five hundred and fifty feet more, making its whole height nine hundred feet above the savannah, or thirteen hundred above the sea.

After some days spent in toiling against the stream and crossing extensive savannahs, they reached a settlement of Wapisianas, where, although most of these Indians had never before seen a white man, they were kindly received. These were tall fine-looking people, with regular features and large noses, very different from the Malay nose of the Warrau and Arawaak. The women were stout, and wore their hair hanging down over their shoulders.

With a Wapisiana for a guide, the party proceeded along a chain of hills leading to the granite and well-wooded range of the Carawaimi mountains, the highest peak of which, estimated at two thousand five hundred feet above the plain, they crossed, and descended to their camp near the banks of the Guidaru. On their way, a large quantity of sugar-cane, almost wild, was passed; also the arrow-plant (*Gynerium saccharinum*), resembling the sugar-cane in its growth and leaves, and highly valued by the Indians; amidst these the beautiful *Amaryllis belladonna*, with its brilliant scarlet flowers, grew in great profusion.

Descending the Cuyuwini, and passing several settlements of the Taruma Indians, they entered the Essequibo, and proceeded along this river to its junction with the Caneruau, when they struck off

in a southerly direction to a Woyawai settlement, and visited afterwards a village in latitude 12 min. south. They had thus crossed the equator at noon, and had so far accomplished one of the objects of the expedition.

Immediately on returning to the boats, they started on their further ascent of the Essequibo. The river flows through a rich mountain valley, but is narrowed to fifteen yards, and was much obstructed by trees which had fallen across it. During the first two days, the rapidity of the current was two miles and a half an hour, running over a pebbly bottom, and about three feet deep. On the next day, finding they could make no farther progress in their corials, they set out by land along the banks of the stream, ascending through a mountain valley densely covered with wood. After three days' painful march, they arrived at one of the sources of the Essequibo, at a spot surrounded by high trees interwoven with lianas, so much so that no sight could be got of sun or stars; but, by the courses and distances, it must be in 41 min. north latitude. The British ensign was hoisted and secured firmly to one of the trees, there to remain till time shall destroy it; Her Majesty's health was drank in the unadulterated water of the Essequibo, and the party returned to their corials.

The Sierra Acarai, among which the Essequibo takes its rise, is very densely wooded; at times the stream meanders at the very foot of the mountains, and at others recedes to some distance; but even

here it retains its peculiar characteristic of being studded with granitic boulders.

The expedition returned to Annai, and thence to Pirara, which was to become the scene of the labours of the Rev. W. Youd, the first Protestant missionary to the Indians of the interior of Guiana, and who arrived on the 15th of May. The settlement was much increased in numbers; and all the Macusis—men, women, and children—were busily employed in finishing the chapel; the missionary's house being already completed, besides thirty huts. The Macusis are a kind and hospitable tribe, and appear to be less indolent than the Indians generally. The birthday of our Sovereign (May 24) was duly kept in this remote corner of her dominions, and the British union waved at Pirara. Nor could a naturalist forget that on the same day, in 1695, the great Linné was born at the obscure village of Raschult in Sweden.

From this place Mr. Schomburgk made several excursions upon the neighbouring savannahs, now mostly overflooded by the great rains. At length, accompanied by Mr. Youd, he left Pirara under the escort of the commandant, and on the afternoon of the 30th June arrived at Fort St. Joaquim. They were received with great civility; and two comfortable houses were given up to them for their quarters, so long as they might think it convenient to remain.

Fort Saõ Joaquim is situated on the eastern shore of the river Takutu, a short distance from its con-

fluence with the Rio Branca, Parima, or Urariquera. It was built to prevent the incursions of the Spaniards and the Dutch, has fourteen embrasures, mounted with eight nine-pounders in tolerable condition, and is garrisoned with a commandant and ten privates of the provincial militia. A small chapel and five houses constitute the village; and a priest visits the fortress every two or three years, to administer to the spiritual wants of the inhabitants. The cattle-farms in the vicinity are under an administrator, who receives one-fourth of all the cattle which he brands with the government stamp. The number of cattle was stated to consist of three thousand head penned, and five thousand head wild, with five hundred horses.

The dreary time of the tropical winter was spent in Saõ Joaquim, arranging the notes of the former expedition, constructing a map of the Upper Essequibo, and making astronomical observations whenever the changeable weather afforded an opportunity. Vague accounts of the Sierra Grande, or Caruma of the Indians, about thirty-one geographical miles below Fort Saõ Joaquim, had long ago awakened in the mind of Mr. Schomburgk a desire to visit it. He had been told, too, of a large lake with black water, in which dolphins were as common as in the Rio Branco, and which wanted only large ships sailing on its surface to make it another Lake Parima. Thither, therefore, he planned an excursion with Senhor Ayres, of the Fort; and three days' journey brought them to the foot of the mountain

in question. They resolved to ascend it from its western side, and to follow it along the whole ridge. On reaching a rocky plane, inclined at an angle of forty degrees, and quite smooth, a fine prospect opened; the mist was still hovering over the valley, and only the summits of the Mocajahi mountains, looking like islands rising out of the ocean, were visible. Much difficulty was found in cutting a passage, in consequence of the dense vegetation, but several other of these elevated rocky planes were ascended; and after many obstacles, the highest or eastern summit was reached, from which the eye commanded a glorious view of the surrounding country, amply repaying the toils of the ascent. It is hardly necessary to say that no lake was found; nor did there appear any reason for believing that one had ever existed.

Having descended the mountain, they were overtaken by night, and with it complete darkness, only lighted up by the dark red flitting light of the large fire-fly,—much more brilliant than the pale phosphoric light shown by the species near the coast. On arriving at a Senhora Liberada's, the canoes of the press-gang came in,—a villainous looking body lately sent by the Brazilian authorities under the plea to press Indians for the navy. Of these unfortunate Indians, there were only nine men, three of whom were upwards of sixty years old; the rest consisting of women and children! They were Wapisianas and Atorias from the Ursato mountains, at the eastern bank of the Tahutu, and were

led to Fort San Joaquim, where our travellers again found them.

Here, it is but due to him to state, Mr. Schomburgk exerted himself to the utmost in behalf of these oppressed beings; and succeeded in obtaining a promise from Senhor Ayres, that the details of the atrocities attending their capture (they had been literally *burnt out* of their huts and *driven at the point of the bayonet!*) should be communicated to his brother, the commandant of the civil and military affairs of the *comarca* or district, with the hope that only those who could serve in the navy would be selected, while the aged, the women, and children would be returned. It was his opinion that the inferior officers wished to use "the pressing of Indians for the Brazilian navy" as an excuse to procure young and old, in order to sell to their allies those who were not fit for that purpose. When the boundaries of the rich and productive colony of Guiana shall have been been decided by a government survey, it is to be hoped that peace and happiness will be insured to those who dwell on the British side of the frontier.

Mr. Schomburgk left Fort San Joaquim on the 20th September, 1838, under a salute of seven guns; and, sailing up the Takutu, and passing its confluence with the Zuruma and the Mahu, entered the latter river, and, landing at the rivulet Pirara, walked to the Macusi village of that name. Here, with his companions, he remained some days. At length the column was put in marching order; the

coxswain at the head, carrying the British union flag, under which they had been marching for the last three years through hitherto unknown parts of Guiana. Now it was to lead them beyond the British boundaries, into regions only known to the copper-coloured Indian; but they were animated with the hope of reaching, for the first time, from this side of the continent, that point which Baron Humboldt had, in 1800, after many difficulties, arrived at from the westward,—namely, Esmeralda on the Orinoco. They now bent their way across the savannahs, a dreary march, and at night were surprised at finding themselves surrounded by an ocean of flame. The hunters had set the savannahs on fire, black columns of smoke were rolling onwards, and the noise of the hollow stalks of the large grasses, bursting with the heat, was almost deafening.

Having crossed the Mahu and continued for some distance over the savannah country, they turned to the northward and entered a basin-like expanse, surrounded by high mountains, amongst which are three peaks, especially remarkable from their singular appearance. The highest, estimated at fifty feet, appeared to be of columnar basalt, terminating at the summit with an abrupt pillar; of the remaining two, one was a group of trap rocks, and the other a mass of rock which any traveller might mistake for the stump of an old tree, and which the Indians call *Puré-piapa*, signifying "the headless tree." The rock rises to an altitude of fifty feet; its sides partly

covered by red lichen; while on its summit a *jabiru* or stork had built its nest, and above this was seen the head of a young one. On the approach of the travellers, its mother hastened from a neighbouring savannah to its protection, and, perched on one leg on the summit of the rock, stood sentinel over the plain around. *

Ten days' journey hence brought the expedition to a settlement of the Arecunas. These are of fairer complexion than the Macusis, and of the same make; indeed, they are but a brother tribe. Next day they crossed the Yawaira flowing northwards, and a tributary to the Caroni; and entered therefore the basin of the Orinoco, which is divided from that of the Amazons by a ridge of sand-stone mountains. At an abandoned settlement, a view was obtained of those remarkable mountains, of which Roraima is the highest. They were wrapped in dark clouds, and distant about forty miles north-north-east.

Following the foot of a range of sand-stone hills, and crossing several ridges, &c. where they experienced intense cold, the party at length came upon Roraima, and saw it in all its grandeur, from an elevation of three thousand seven hundred feet above the Arekuna village of Arawayam; its steep sides rise to a height of fifteen hundred feet, the summit is therefore five thousand two hundred feet above Arawayam. The sides, of compact sand-stone, are as perpendicular as if erected with the plumb-line,

* See Views in Brit. Guiana, by R. H. Schomburgk.

and are overhung in some parts with low shrubs. The most remarkable feature of these rocks is the precipitation from their enormous heights of waters which flow in different directions into three of the mightiest rivers in South America, viz. the Amazon, the Orinoco, and the Essequibo.

After a stay of twenty-five days in the neighbourhood of Roraima, they set out on their journey towards Esmeralda on the Orinoco; their general course thither being south-south-west. On their way they were shocked by the skeleton of a human being, near the site of a cabin which appeared to have been burnt down: it had probably lain there for months; and was said by the Macusis to belong to one of their tribe, who was blind, and had lost his way and miserably perished.

The party had travelled thus far, when an unfortunate accident occurred to one of their guides, whilst fishing at a brook: he was bitten by a rattlesnake, and brought in senseless; his eyes bloodshot, his sight affected, head giddy, and limbs quite rigid. However, he was recovered by prompt suction, the application of a ligature, and the prescription of some palliatives.

On the 3d December they reached a Zapara settlement of upwards of sixty Indians,—a mixed assemblage of Purigotos and others. Some were Oewakus, who live in a wild state at the sources of the Uraricapara, neither women nor men wearing any covering; their huts are moved from place to place, and they are exceedingly timid. Very diffe-

rent were the Maiongkongs and the Mauitzi, inhabiting the Merewari and Paraba; their figures broad and muscular, of good height, and haughty mien. With one of these for a guide, our travellers embarked on the Parima, which is the continuation of the Rio Branco, and ascending this river, and encountering its rapids, arrived in the course of a fortnight at a settlement of Waiyamara Indians, where a fresh stock of provisions was obtained. The captain or chief received them sitting on a low stool, surrounded by his men, all armed with war-clubs: having heard what his visitors had to say, he rolled up a few leaves of tobacco in the inner bark of the *cakaralli*-tree (*Lecythis ollaria*), in the form of a cigar, lighted it, and after smoking it for a little while, handed it to Mr. Schomburgk. This custom, though very common among the North American Indians, our traveller had never seen before among the Indians of Guiana. This party consisted of forty-five individuals, besides those who were absent clearing a new space for provision grounds; they looked sickly and haggard, and were a striking contrast to the more robust and healthy Arekanas.

The expedition afterwards passed a provision plantation of the Kirishana,—a wild and warlike race, inhabiting the mountains between the Orinoco and Ocamo, and who go without clothing and live almost entirely on game and fish. As the Oewakus are despised, so the Kirishanas are dreaded by the other Indians; they make no scruple of plundering

the more defenceless tribes whenever they find an opportunity, and their poisoned arrows are always ready. From the excessive fear of these savages entertained by his Indian guides, Mr. Schomburgk owed many obstacles to his further progress; nor does such fear appear to have been altogether unfounded, if their relations are to be credited.

The travellers now found it impossible to make their way farther by water. They therefore directed their course over mountains five or six hundred feet high. Their last cassada-bread was gone, and they had to subsist as they could on mountain-cabbage and wild fruits; game was hardly to be found, and even fish was scarce. Ere seven days had elapsed, however, as they were entering the river Merewari, they were gladdened by the sight of a corial which they had expected with a fresh supply of cassado, and the favourite drink of the Indians, paiwarri; no small treat to men in their situation. Shortly after, too, they reached a settlement of the Guinaus, from whom they received some trifling assistance.

More than two weeks of an arduous and toilsome journey, conducted for the most part over steep and rugged mountains, brought them once more into the system of the Orinoco; but it was only to put an end to Mr. Schomburgk's anxious hope of reaching the sources of that river. The outrages of the Kirishanas had excited a general panic, which infected his guides to such an extent, that they not only peremptorily refused to go forward, but made

hasty preparations for taking to their heels. In vain was every bribe offered to them; and our traveller, after arriving within thirty miles of his object, was fain to turn back, in order to proceed to Esmeralda.

Making, therefore, a long circuit to the northward, and then proceeding up the river Paramu, he entered, after twenty days of a weary travail, over a wild and unknown country, the river Orinoco, in latitude 2 deg. 54 min. north. This elsewhere mighty river was here obstructed with sand-banks, and only twelve to fifteen inches deep; with so little current, that in many places the water appeared stagnant. The banks were low, and the adjacent country flat, only now and then broken by isolated hills, densely wooded; to the northward, however, the mountains of Duida seemed to rise to the clouds.

The expedition halted at a sand-bank opposite the river Wapo, where they were tormented by swarms of sand-flies, under a heat of 130 degrees in the sun. Thence they started towards Esmeralda, and at length came in view of a fine savannah extending to the foot of the mountains, which from Humboldt's description was known to be that of Esmeralda;—some canoes tied to the river's bank showed him the landing-place. The emaciated forms of his Indian companions and faithful guides told more than volumes what difficulties had been surmounted; but his object was realized; his observations, commenced on the coast of Guiana, were

now connected with those of Humboldt at Esmeralda.

The village was a few hundred yards from the shore; half-way to it they were met by the Alcade, who welcomed them, in Spanish, to his hut, where his wife, children, and grandchildren had assembled. He was attired simply in a shirt made of the bark of a tree called *marima;* and, excepting a miserable half-starved looking being of an Indian, who had not long arrived from Brazil, he was the only adult male inhabitant of the place.

Thirty-nine years had now elapsed since Alexander von Humboldt visited Esmeralda, and found in the most remote Christian settlement on the Upper Orinoco a population of eighty persons. The cross before the village still showed that its inhabitants professed to be Christians; but their number had dwindled to a single family,—a patriarch and his grandchildren. A ridge of heaped-up boulders of granite, named Caquire, occupies the fore-ground, and at its foot Esmeralda is situate. Some pious hand had planted a cross on the largest of these blocks, the airy form of which stands boldly in relief against the blue sky, reminding the traveller that there are still some in this wilderness who adore the Deity and acknowledge a crucified Saviour.

If, however, the works of man in this secluded spot have fallen into decay, Nature still remains the same. Duida still raises its lofty summit to the clouds; and flat savannahs, interspersed with tufts of trees and the majestic Mauritia palm, stretch

from the banks of the Orinoco to the foot of the mountains beyond, giving to the landscape that grand and animated appearance which had so much delighted Humboldt. *

As the object in the present abstract has been to furnish an outline of his route, with such of the incidents that occurred as appeared most worthy of note, rather than any account of all that he visited, and all that he saw, examined, and heard; and as, moreover, we have accompanied him to the extreme point—the climax, so to speak, of his long and arduous journey,—it will be sufficient, perhaps, to state, that, after remaining three days at Esmeralda, Mr. Schomburgk with his companions embarked in canoes on the river Orinoco, on their return homeward: that they descended this river to its junction with the Cassiquiare, and, by way of the latter, to the Rio Negro; stopping at Barcellos (once the capital of the Capitania do Rio Negro), and afterwards at the Ilha de Pedra, to examine the picture-writing for which this little island is so remarkable; thence proceeding up the Rio Branco, until, arriving at Santa Maria, on its eastern bank, they landed at that settlement, and found a number of the Indians who had been taken in the late slave-hunt, or descimento. It appeared that the government had ordered that the old men, women, and children, captured on that occasion, should be released and sent to their homes. These, consisting of two old men, five women, and two children, our

* See Views in Brit. Guiana, by R. H. Schomburgk.

travellers found in an almost starving condition, and were assisted by the party in a small craft bought for the purpose.

On the 22d April they reached Fort San Joaquim. Seven months and two days had elapsed since their departure from this establishment; during which period the expedition had made a circuit of about two thousand two hundred miles, through a tract comprising the sources of the northern tributaries of the Takutu, the waters of the Mazaruni, the sources of the Caroni, northern tributaries of the Narima, the sources of the Parawa, the Parima proper, the Merewari, the Orinoco, the Cassiquiare, and the northern tributaries of the Rio Negro to the confluence of the Rio Branco, which river they had now ascended for three hundred miles, including its windings, in twenty days, and eventually reached their starting point at Fort San Joaquim.

On arriving at Pirara, they found a Brazilian detachment in possession, who ultimately drove away the zealous missionary, the Rev. Mr. Youd, and dispersed his flock. What right the Brazilian government had thus to act, need not be discussed here; but let the fact be reported, that the former chapel was converted into barracks, and the building where the first seeds of Christianity had been sown amongst the benighted Indians, became the theatre of obscene language and nightly revels.

After three months' drought, the first rain fell at Pirara on the 3d May, and with it commenced the

great change of weather; the rivers began to swell, and by the middle of May the savannah represented a lake, out of which Pirara, being eighty feet above the level of Lake Amucu, rose like an island. Towards the end of May, the heavy canoes of the expedition, with their collections, were launched on the Quatata, which communicates with the Rupununi; they soon floated on the latter river, and, carried rapidly forward by a strong current, reached its junction with the Essequibo on the 11th June. The Essequibo was full to overflowing, and its falls no longer impeded their progress; so that in four or five days they reached the Protestant mission at Bartika Point, under the firing of guns and hoisting of flags. By a strange coincidence, Mr. Schomburgk was on this occasion, as he had been on his return from his first expedition, received on landing by the Bishop of Barbadoes, who was now, as then, on a visit of inspection to the mission: it was with sincere regret that that prelate heard the sad news of the dispersion of the mission at Pirara.

Two-and-twenty months had elapsed since Mr. Schomburgk had passed this spot, on his ascent of the Essequibo, and bade adieu to civilized life and its comforts. During this period he had examined the Essequibo to its sources; made the circuit of upwards of three thousand miles, chiefly by water; and was now, by the blessing of Providence, returning safely to Georgetown, which he reached on the 20th June, 1839.

Such is a brief and very condensed sketch of the various expeditions accomplished by our author, and which, as he has been so kind as extract for us, will at least possess the merit of authenticity. A sojourn of nearly ten years under the tropics, and a life spent in exposure to the sun and every vicissitude of seasons, had exercised their influence upon the health of our travellers; while the attacks of sand-flies (a species of *simulia*) and of musquitos (*culex*), during the journey to the Upper Orinoco and his stay at Esmeralda, had been so severe as to induce a degree of fever, which vapour-baths and the good medical treatment in Georgetown could only in part remove; and a visit to Europe was proposed, both as the only remedy for his complaints, and also as the only way in which Mr. Schomburgk's discoveries and exertions could be properly made public. In consequence, he embarked in a voyage for London, accompanied by three Indians who had been his companions in the interior: all his collections, drawings, plans, manuscripts, and observations, which arrived in safety, and have been for many months in part laid before the different scientific societies of the metropolis, bear ample testimony of his qualifications, either as a general observer and one who can enter into almost any branch of physical geography, or as a zoologist and botanist.

Independently, also, of the accessions made to our knowledge of these branches of philosophy,

attention has been devoted to the state of the native tribes; and as we may gather from various passages in the foregoing extract, a deep interest was felt in whatever would tend to improve their moral condition. Mr. Schomburgk has the satisfastion of thinking that he again returns to Guiana, after having successfully directed the attention of the British public to the state of the aborigines in one of her most fertile colonies. The destruction of the missionary settlement by the Brazilians, and the destitute condition in which most of the native tribes have been seen to be at present existing, together with their apparent willingness and ability to receive and comprehend the instructions of the missionaries, have induced our government to investigate the subject, and it was brought under the notice of parliament in March last, when a survey of the boundaries was determined upon, and under the sanction of a royal commission, Mr. Schomburgk has been selected again to superintend and command an expedition to Guiana. A liberal salary has been granted, draftsmen and an assistant surveyor have been added to the party, chronometers and other instruments have been furnished from the best makers in England, and ere these pages shall have been printed, the party will have crossed the ocean and entered upon their arduous but most interesting pursuits. May success attend their exertions, and may the Indian as well as European reap the advantages accruing from the patronage of our

government, aided by the energy of a zealous and scientific traveller. *

* Mr. Schomburgk, during the few months (about fourteen) he has resided in Britain, in addition to the materials which he has contributed to the present volume of the Naturalist's Library, and some papers in our scientific periodicals, has furnished reports of his later expeditions in Guiana for the Geog. Society's Journal; Parliamentary Papers relative to British Guiana, ordered to be printed 11th May, 1840; "A Description of British Guiana, Geographical and Statistical, exhibiting its Resources, Capabilities, &c." 8vo. Simpkin and Marshall (already translated into German); and the great work illustrating the scenery of the country, "Twelve Views in the Interior of Guiana, after Sketches taken during the Years 1835 to 1839, with descriptive letterpress, by Robert H. Schomburgk, Esq." Ackermann, and Co., London, 1841.

THE

FISHES OF GUIANA.

INTRODUCTION.

The Botany and Zoology of Guiana have found able historians; but it appears that Ichthyology, that interesting branch of the Natural History of a district so much intersected by mighty streams and numerous rivulets, has been much neglected. It is true that Bloch in his splendid work, and also his successor Schneider, gave us a description of some of the inhabitants of the fresh-water rivers of Guiana; and, at a more recent period, Lacepede, Humboldt, Spix, Agassiz, Cuvier, and his able coadjutor Valenciennes, have added a few to the number previously known; but with these single exceptions, the knowledge and history of the fishes of Guiana have remained almost a sealed book to the scientific world. If we, however, divest the history of its finny tribe of all our technical phraseology, and do not restrict it to a description of their external cha-

racters, anatomy and physiology,—the Indian, the son of one of Nature's most magnificent provinces, has from his childhood been a close observer of all the objects of nature by which he is surrounded; and his knowledge of the inhabitants of the numerous rivers of his country is perhaps the more perfect, since, in a great measure, his precarious subsistence depends upon his success in fishing.

In 1835, an expedition to Guiana for extending our geographical knowledge, and that of the productions which were indigenous to a fertile soil and congenial climate, was resolved upon by the Geographical Society of London, and when having received the sanction and assistance of Her Majesty's government, the command of the exploring expedition was confided to me, it was natural that a branch of science which is invested with the highest interest, whether we view it in an economical or in a scientific point, should receive a great share of my attention. But with the exception of my Indian friends and Dr. Fleming's Philosophy of Natural History, I had nothing to guide me in my researches, the scientific Ichthyologist may therefore be disappointed in my remarks; and I was so well aware of this defect, that on my return to Europe, I yielded only to the persuasion of my kind friend Sir William Jardine to give my information in its present form to the public.

In the course of these expeditions in the interior of Guiana, and which occupied me from 1835 to 1839, every means were taken, not only to ascer-

tain the habits and manners of such fishes as came under our inspection, but likewise to secure, by faithful delineations, the appearance of their outward forms and colours.

How evanescent is that splendid hue, that change of colour, which delights us so much if we see the nimble fish near the surface of the water, and watch its motions,—now darting forward, now wheeling or assuming every posture between the horizontal and perpendicular! To represent the variety of beautiful tints when in its natural element, is a task as yet unaccomplished by the painter's brush. It has been my particular aim, that the colours of those which were drawn, during our expedition, should come as near to nature as this difficult task would permit. The first specimen of any fish, a drawing of which we did not previously possess, served generally to sketch its outward forms and general colours on the paper; and when we were fortunate enough to secure a second specimen, those delicate hues were painted in, which are only visible immediately after the fish comes out of the water, and which so quickly vanish when life is extinct. I found a most able coadjutor in Mr. Vieth, who accompanied our expedition, and who entered with the greatest enthusiasm in our ichthyological researches. He has since fallen a martyr to his researches, as a bite of one of the poisonous snakes of Guiana, although inflicted many years since, caused ultimately his death, in December 1839.

The number of fishes which thus were drawn and described, during our expedition, amounted to upwards of eighty, all of which were found in the fresh waters. The late Mr. Hillhouse, in his "Indian Notices," enumerates twenty-six species as peculiar to the coast, estuaries, and rivers of Guiana. How incomplete this enumeration was, is shown by the number which have been secured during our expedition, in the rivers of the interior alone; and I consider my own list so incomplete, that in my pending expedition I hope to collect materials sufficient for a second volume, in which will be included the fishes of the estuaries and coast also.

The scientific world has much to regret that the interesting researches of Dr. Hancock in Guiana are intended to remain a hidden treasure. His long sojourn in those regions, and his scientific acquirements, would have rendered him particularly qualified to become an illustrator of the natural history of Guiana. But it appears that his researches are only intended for his personal gratification, and with the exception of a few detached papers printed in some of the scientific periodicals, we cannot pride ourselves of having profited much by his long experience and researches in South America.

From these preliminary remarks, let us turn now to those regions which have been lately visited by me, and which become of interest as the locality of the fishes, a description of which is to occupy the present volume.

Guiana, or Guayana,* famed through Sir Walter Raleigh's attempt of discovering in its territory the fabled El Dorado, is that part of South America which lies between 8 deg. 40 min. north latitude and 3 deg. 30 min. south latitude, and the 50th and 68th degree of longitude west of Greenwich. It is bounded on the north by the Atlantic and the eastern course of the river Orinoco; on the east likewise by the Atlantic; on the south by the rivers Negro and Amazon; on the west by the northern course of the Orinoco, the natural canal of Cassiquiare, and the southern course of the Rio Negro; and its greatest extent, between Cape North and the confluence of the Rio Xie with the Rio Negro, is 1090 geographical miles; its greatest breadth, between Punta Barima, at the mouth of the Orinoco, to the confluence of the Rio Negro with the Amazon, is 710 geographical miles. Its line of sea-coast extends between the Amazon and the Orinoco, and is divided into Brazilian, French, Dutch, British, and Venezuelan Guiana.

The coast lands consist in general of alluvial flats, which extend from ten to twenty, and in some instances even to forty miles inland, and are terminated, so far as this territory has been under my personal investigation, by a range of sand-hills of moderate height. Almost parallel with the ridge of

* The British portion is called *Guiana* in official documents; *Guayana* is the Spanish name; *Guianna* the Portuguese. It is said to have received its name from a small river or tributary of the Orinoco.

sand-hills run several detached groups of hillocks, which in French Cayenne almost approach the sea-coast. A chain of mountains, which I am inclined to consider the old boundary of the Atlantic Ocean, crosses Guiana in a south-eastern direction, through which the large rivers of that district have forced themselves a passage, their course being impeded by numerous rapids and cataracts. The culminating point of this chain, which is connected with the Pacaraima mountains by detached groups, is a range of sand-stone mountains, of which the highest is called Roraima by the Indians; its eastern point is in latitude 5 deg. 9 min. 36 sec. north, longitude 60 deg. 47 min. west. This remarkable mountain group extends twenty-five miles in a north-west and south-east direction, and rises to about 7500 feet above the sea, the upper 1500 feet presenting a mural precipice. Down the face of these mountains rush numerous cascades, which eventually form tributaries to the three great rivers of Guiana, namely, the Amazon, the Orinoco, and the Essequibo; and they form, therefore, the separation of waters of the basin of the Orinoco and Essequibo on the north, and the Amazon on the south.

The Sierra Acarai gives rise to some of the largest rivers of Guiana. This mountain chain crosses the axis of that imaginary line of geographers, the equator, and its average height is about 3000 feet. Here the rivers Essequibo, Corentyn, Maroni or Marooini, and several tributaries of the Amazon,

have their sources. This chain forms, therefore, in Guiana, the separation of waters between the basins of the rivers which flow northward into the Atlantic and those which enter the largest river of the known world,—the Amazon.

This extensive territory is intersected by numerous rivers and streams; I mention only the Amazon, the Orinoco, the Essequibo, with their numerous tributaries. A short portage of about seven to eight hundred yards separates the basin of the Amazon from that of the Essequibo; and by traversing this portage during the rainy season, the river Amazon and the upper Orinoco may be entirely reached from Demerara by inland navigation. So great is the facility for water communication in that part of South America, that by traversing the portage above alluded to, and by constructing a canal of about three miles' length, between the Guapore, a branch of the Marmore and Madeira, and the Rio Aquapehi, a branch of the Jaura and Paraguay, an inland navigation would be opened between Demerara and Buenos Ayres over an extent of forty-two degrees of latitude. The river Napo offers communication with Quito, the Ucayali with Cuzco, the Huallaga with Lima. Ascending the Rio Negro, and entering the Orinoco by the natural canal the Cassiquiare, its tributary the Meta offers an uninterrupted navigation to New Grenada, and within eight miles of Santa Fé de Bogota.

Few countries on the surface of the globe can be

compared with Guiana for vigour and luxuriance of vegetation. The fertility of the soil, the humid climate and congenial temperature, insure a succession of flowers and fruits. To a person accustomed to the sleep of Nature during winter in the northern regions, that continued luxuriance of vegetation cannot but raise astonishment and admiration; here with bountiful liberality she has clothed it in the richest garments of tropical verdure, and with a mighty hand has stamped it with a portion of her sublimest features. The majestic scenes which I viewed during my exploring tours, impressed themselves with indelible characters upon my mind; which are the more powerfully awakened since my return to Europe, when comparing our vegetation with the magnificent scenes which plain, mountain, dale, or forest present under the tropics.

On ascending the great rivers, which have been so happily called "the veins of the country," we find them covered with verdant isles; and as we approach the primitive forests, the landscape assumes the features peculiar to the tropics. Gigantic trees raise their lofty crowns to a height unknown in the European forest, and display the greatest contrast in the form and appearance of their foliage. Lianas cling to their trunks, interlace their wide-spreading branches, and having reached their summits, their aërial roots descend again towards the ground, and appear like the cordage of a ship. Clusters of palm-trees, of all the vegetable forms

the most grand and beautiful, rise majestically above the surrounding vegetation, waving their pinion-like leaves in the soft breeze.

This is the picture, which I have attempted to trace, of that part of Guiana which forms the British territory, * and which refers equally to the regions between the Amazon and the Orinoco.

Many of the animals and birds which inhabit Guiana afford a wholesome and delicate food, but I must pass them over without entering into a detailed description, as it is the finny tribe which proves for the present the object of my greatest interest. The rivers of the interior teem with delicious fish in great variety, which vie in delicacy with any of our European fresh-water species, and contribute equally to the nutriment of man.

How I delight in recalling the scenes and adventures of our exploring tours in Guiana! I still recollect, when starting on our first expedition, we approached the embouchure of the majestic Essequibo, forming at its mouth an estuary nearly twenty miles wide, and divided into four channels by three islands. Numerous other islands follow on ascending, until the last traces of cultivation are passed, and we see its banks lined by primitive forests, only here and there interrupted by a solitary cottage. From the margin of the water, as far as the low land permits the survey of the shores, on either side, extends an immense forest. We ascended

* See Description of British Guiana, by Robert H. Schomburgk, p. 30.

in a schooner, as far as the confluence of the Mazaruni with the Essequibo, where we made the necessary preparation for our further journey. The canoes which were selected for that purpose are manufactured by the Indians, and consist of the trunk of a huge tree, which has been hollowed out, partly by the axe, partly by the fire. They are sometimes from thirty to forty feet long, and are peculiarly qualified for these rivers, as they draw but little water and are less subjected to leaking when drawn over cataracts or coming in contact with rocks, than if they were constructed of timbers. A covering of palm leaves is substituted for an awning. As the largest of these canoes is seldom more than four feet wide, its load must be restricted, and the baggage is generally placed in such a manner that, arrived where a cataract opposes obstacles to further progress, it may be unloaded and carried over land. The Indian propels his canoe by paddles; these are generally about five feet long, of which the blade occupies about two feet. The Caribs and Macusis prepare their paddles generally of the *yaruri* or *massara*, a very curious tree, which has the appearance of being fluted, or as if it consisted of numerous slender trees all grown together at the centre; the flat or tabular projections of the lower part of the trunk qualify them peculiarly for their construction, besides which, the wood is light, elastic, and very strong. I have frequently seen the Indians split one of the flutes off, and finish a paddle in the course of a few hours,

having no other tool but a cutlass and a common spear-knife; it was then handed to the women, who painted it with *rucu* * and *lana*, the former of which colours red, the latter black.

The Indian sits or squats on the thwart of the canoe, fronting or looking towards the bow, and grasping the handle with his right hand; if he sits on the larboard side, he puts the left just a little above the blade of the paddle, strikes outward into the water, and having pulled forward, gives the blade a slight turn, so as to present the edge, and prevent unnecessary splashing when he withdraws it in order to repeat the former movement. There is no rudder to steer by, but the Indian who acts as coxswain has a paddle of larger dimensions, and, taking his seat at the stern, he directs the course of the boat with as much agility as if the canoe possessed one of the common rudders.

Their mode of paddling is various; if it be on a long intended journey, a long and strong stroke is required; but if perhaps only a short distance is to be made, or on approaching a settlement, the stroke is varied; and keeping a certain time, the handle is knocked against the side of the canoe at each stroke, sometimes twice slow and thrice in

* It is produced from the red pulp which covers the seeds of the *Bixa orellana;* perhaps better known in England by the name of *arnatto*, where it is much used for dyeing cheese. The *lana* is the fruit of *Genipa Americana*, the juice of which gives a fine black dye.

double quick time. A European, unacquainted with their mode of paddling, is awkward, and is sure to draw their ridicule upon himself, by knocking the fingers of the hand which is near the blade against the canoe; but an Indian paddles with grace, and his arm forms a fine arch, showing what sinews he possesses.

The canoe is flat on the bow and stern, and in order to prevent the water from getting into it, two pieces of wood cut according to its shape are fitted in, which the Indian never fails to ornament according to his fashion.

The *corial* narrows to a point towards the stern and bow. Like the canoes, they are scooped out from the trunk of a tree, and have no keel,—which indeed would be quite a superfluous appendage, as it would be soon knocked off by coming in contact with sunken rocks, or when drawn over cataracts.

The *pakasse*, or woodskin, is a boat merely constructed of the bark of a tree. It is generally made of a single piece of the tough bark of the *murianara* tree, which grows to a very large size. An incision of the length the boat is to possess is made in the bark, which is removed from the trunk by driving in wedges; when loosened from the wood, it is kept open by cross sticks, and is supported at the extremities upon two beams, in order to raise those parts of the intended boat. Vertical incisions, at about two feet apart, and a few inches in depth, are then made, and the parts secured

afterwards by overlapping. It remains for several days exposed to the weather before it is fit for use. Though the pakasse is so crank that the slightest motion, when once in, renders it liable to upset, I have seen pakasses among the Tarumas, in the Cuyuwini, with five or six Indians in them. Their great advantage is, that being flat, they can float, where a common corial of the smallest description cannot pass; and are so light, that in crossing cataracts, one man can easily carry his boat on his head. When propelled by one man, he squats in the middle and paddles on either side. Great care is requisite in stepping in or out of them, as, if upset, they sink almost instantly, owing to the great specific gravity of the peculiar bark of which they are built.

When we ascended the river Berbice, two Waccawai boys belonged to our party, who navigated one of those pakasses. They were perhaps not more than eight years old, but we were highly delighted to see how ably they managed it. The boat seemed to fly through the water; and the juvenile steersman directed its course with such judgment and precision, that it never grounded, though it went over places where there was not more than eight or nine inches water. They were equally expert in the use of the bow and arrow; and wherever they observed one of the finny tribe, the pakasse was halted, the bow strung, off flew the pointed arrow, and when taken out of the sand, which the water barely covered, we generally observed a fish struggling for liberty. In spite of these occasional detentions, they were always in the van when the hour approached for our stopping for breakfast or to encamp for the night.

The first impediments which are thrown in the navigation, on ascending the Essequibo, are the Aritaka Rapids, distant about sixty miles in a direct line from the mouth of the river. They are the beginning of a series which extends for six miles, caused by the river's passage through a chain of hills about two hundred feet high. The most considerable of them is the Itaballi Rapid, and the manner in which these impediments are overcome is as follows. If we except the larger cataracts, where the mass of water falls over a level ledge, and to overcome which the canoes must be drawn

overland, large blocks generally divide the river, through which it forces itself a passage by numerous fissures, sometimes merely a few feet in breadth, in other instances from fifty to sixty and upwards. At the base of the blocks which form these rapids there is generally an eddy, where the canoe is almost stationary, having no current either way. The head of the canoe, after a long hawser has been fixed round her bow, is brought to the stream, and the most intrepid and best swimmers of the crew now attempt to reach the next rock, either by wading, a courageous leap, or by swimming; when successful, the canoe or corial is pulled into one of the shoots of the fall where there is water enough to float her, and by main strength she is hauled up the ascent, the steersman (sometimes lashed for security's sake to his seat) attempting to direct her course as far as in his power by his large paddle. Safely arrived at the head of the rapid, she is taken out of the current, and her stern laid against the top of the rock with her head up the stream; the crew instantaneously spring into her, and paddling with all their strength, they endeavour to cross the current of the succeeding rapid, until they get into another eddy. It is evident, should the rope break in hauling her over the ascent, or if the crew are not active in jumping into the canoe when lying against the rock, and should not be strong enough to pull against the current, the head of the canoe is turned, and she drifts broadside down the fall, where she must

infallibly upset, should she even escape the danger of the rocks, where otherwise she would be dashed to pieces.

The hauling of canoes over rapids affords a most enlivening scene; the activity of the Indians is only in such instances brought in perfect play. Here we see a party attempting to swim towards one of the rocks which are partly raised above the surface of the river, while others are wading alongside the canoe up to their waists in water. Their cheerful cry when, yielding to force, she stems the current and is drawn by means of the rope towards the rock where the Indians are standing, is a peculiar feature of the scene attending the passing of a rapid, and the roar of the water, and the wild grandeur of the surrounding scenery, assist to make the picture impressive.

Where the nature of the cataract permits it, the canoe in descending the river is let down by ropes, to avoid its being dashed to pieces. But this is frequently impracticable, and then her safety depends entirely upon the steersman and the bowman acting in concert and with decision. In descending, the canoe is generally kept in the centre and force of the stream, and, carried forward, she shoots along with the swiftness of lightning; she arrives at the edge of the cataract, and, balancing for a moment, she plunges headlong into the surge below, dashing the spray on either side against the rocks that bound the passage, so as almost completely to conceal the body of the canoe, leaving the men only

visible above the spray; then she rises again above the foaming waters, obeys the steady hand of the helmsman, and skipping over the waves formed by the fall and impetuosity of contending currents, the danger is over, and a simultaneous burst of joy generally escapes from the canoemen, to proclaim their success.

Alas! success does not always attend the descent of these falls, and large is the number of those who have lost their lives in descending the cataracts by the canoe having been upset or split on coming in contact with a hidden rock. I had thus the grief to witness, during our descent of the river Berbice, the upsetting of one of our canoes, while passing one of the Christmas Cataracts, and of her inmates, thirteen in number, Mr. Reiss, a talented young man who accompanied me as volunteer, lost his life by this disastrous accident.

South of the first series of rapids, the Essequibo assumes a new prospect, displaying numerous sand-banks rising above its surface, which obliged us constantly to cross and re-cross to avoid running aground. The guana *(Lacerta iguanna)* had selected them as a deposit for its eggs, which when fresh are a great delicacy. Our Indian canoemen showed great dexterity in securing them, and in a very short time they took some hundred eggs and captured several of the guanas.

We frequently selected these sand-banks for our night-camp, and our attempts in fishing were here generally more successful than when we camped

on the wooded banks of the river. Every one of our canoemen knew his duty: scarcely had the boat touched the selected spot, when all was life and bustle; some were seen running to cut the necessary poles for pitching the tent; others unloaded the utensils wanted for our night-quarters and for that important personage the cook, whose indispensable qualities and skill are only fully acknowledged, when, after a long day's journey, the minutes appear hours to the murmuring stomach which can scarcely brook delay. The gun on the shoulder, the hunters dive into the thick woods, attracted by the noise of the cooing *pauis (Crax alector)*, or a herd of monkeys. The smaller crafts are unloaded, and some of the more skilful archers paddle away from the noisy camp to see whether they are fortunate enough to shoot, with bow and arrow, some *luganani* or other fish.

Fires are seen in all directions, with the simmering earthen pot or *aina* on them, and the squaw watching with anxiety the bubbles which commence to rise on the surface of the water. This contained a guana; the other, part of a monkey; a third, some fish; but all seasoned with capsicum, the indispensable condiment of the Indian's cookery. The tents are now finished: if the weather promises fair, the Indian satisfies himself with putting a few poles in the ground, from which he suspends his hammocks; but if it threaten to rain, and palms or the gigantic leaves of the wild plantain *(urania)* are in the vicinity, then he constructs, in an incre-

dibly short time, a hut which proves impervious to the rain. Some of these huts are square or oblong, others arched, and below it he slings his hammock. Our hut did not differ much in construction, only in place of the roof of palm-leaves we used a curtain of sail-cloth. In the course of an hour our camp was in order, and offered the appearance of a little village. Meanwhile the fishermen and hunters returned, and brought frequently an accession to our approaching dinner, which, after all, was best seasoned by a good appetite.

During night commenced the fishing for *laulau* and others of the family of *siluridæ*. After the hooks have been baited with fish or animal flesh, they are carried out into the stream, the line to which they are attached being about thirty to forty fathoms long. If the Indian feels inclined, he keeps the end on the land in his hand; but frequently he takes a forked stick, which he drives into the ground, and after having tied some dry bushes to the fork, he leads the stray line over it. If a fish should bite, the line being drawn with rapidity over the dry leaves, makes a rustling noise, and the Indian hurries to seize it and to haul the fish in. If it be a laulau (*silurus*) or a large pacaruima (*Phractocephalus bicolor*), some considerable skill is necessary to land the fish without breaking the line or the hook. Many of the siluridæ issue a sound when taken out of the water, but few so loud and so continued as the pacaruima. I have somewhere else observed, that the Indians

have always a bludgeon at hand with which they beat in the thickly armed skull, and each blow is sure to produce the loud grinding sound; so that we who were lying in our hammocks knew whether a laulau, pacaruima, or any other fish had been secured.

The Indian considers that a large fire kindled at the water's edge is sure to attract such fishes as take the bait only during night, and they never fail therefore to have a fire or a large brand when they are fishing for laulaus or pacaruimas.

If large blocks of granite impeded the river near our camp, all hand-lines which could be spared or procured were set in requisition to fish for *pirais* (*serrasalmo*). The avidity with which they take the bait insured success to the least practised in the art of fishing, and if the place proved a haunt of the pirai, the Indian was sure to secure his dinner. The natives possess great art in throwing the hand-line from the shore into the stream; and it is a pretty sight to see the line circling in the air and descending on the water at a great distance from the banks or the rock which the angler has selected for his stand. The Indians use likewise, for the purpose of catching the pirai and numerous other species of that family, the rod, line, and hook. The rod is generally made of yari-yari or lance-wood (a species of *anonaceæ*), which, in consequence of its toughness and elasticity, is peculiarly fit for that purpose. It demands, however, considerable skill to draw the fish out of the water, as of all others

the pirai possesses tenacity of life and considerable strength for its size, and inflicts, besides this, very formidable wounds with its triangular teeth. A bludgeon is always at hand to kill the fish before it is unhooked. If the Indian has been successful enough to secure as many as he thinks he requires for his dinner, some tough slender twig is taken, and one end being put through the gill aperture and then out at the mouth, they are thus strung and carried to the camp.

The Indians are a nation of ichthyophagists, they possess therefore various methods of securing fish, but the most wonderful is the skill which they possess of shooting them with bow and arrow. If we recollect that proper allowance must be made for the false reflection of objects under the surface of the water, and the resistance which the arrow meets, it is really wonderful to see the success which attends this mode of fishing. The sharpness of the sight of the Indian is equally surprising; when the fish is comparatively at ease or rest, I have not been able to see it under the surface of the water, although the Indians pointed it out, and no doubt ridiculed my stupidity in not being able to observe it; but the Indian not only sees the fish when in quick motion, but shoots it likewise with his arrow; making, therefore, just allowance for the false reflection, its progress while discharging the arrow, and the resistance which the latter meets when entering the water. The arrow remaining a moment in a perpendicular

position, and then vanishing, is a proof that his aim has been correct, and that the fish is of considerable size, to sink with the arrow in its body. However, it lasts not long before it is obliged to make its appearance again on the surface. If the fish is very powerful, this is the opportunity to discharge a second arrow into its body, and even a third or fourth if its size demands it. I have seen an arapaima or pira-rucu (*Sudis gigas*) with upwards of twenty in its body before it could be secured.

The bow of the Indian is generally from five to six feet in length, and is made of hard and elastic wood, which is rounded below and slightly concave above; in this we have to admire his ingenuity; if it were perfectly round above, the woody fibres of the bow, when bent, would split. The string is made of silk grass (the fibres of *Bromelia karata*), and is equal in durability to our best bowstrings. There is sometimes a difference in the form of these bows, which indicates the tribe by whom they are made. The most serviceable of the Indians of Guiana are made of wamara, a tree which belongs to the natural family of *lecythideæ;* and for ornament, they likewise choose the latter, or snake-wood, no doubt one of the costliest ornamental woods which Guiana possesses.

The most common arrow which the Indian uses for shooting fish, is the takusi or poya. The shaft of the arrow is from five to five and a half feet

long, and is made of the upper part of the stem of a reed (*gynericum*) which is very common throughout Guiana. A piece of lance-wood or yari-yari, of about twelve inches in length, is firmly fixed to it, which is armed with an iron point consisting of two pieces, namely, the pointed one to inflict the wound with, and a second being bent backward, as a barb or counter-hook. They are fixed with curauya or curawatu, the fibres of the bromelia above alluded to, and are well coated with caran or mani, a mixture of resin and bees-wax. Through the frequent intercourse which the Indians have with the coast, iron is in no great scarcity; nevertheless, where it is not at their command, they use monkey-bones instead, and among the savage tribes, where iron is a precious article, the greater part of the arrow-points are made of monkey-bones.

A peculiar arrow is used for shooting the delicious fish called pacu. They are stronger than the generality of arrows, and are nearly six feet in length. They are called puya by the Caribs and Macusis, and their lower part is not feathered. A long string is attached to the arrow's point, which detaches itself from the shaft. The end of the long string is kept round the little finger of the left hand when the arrow is shot off; and if the fish be struck, the shaft detaches itself, and the fish is hauled in. The line is sometimes plaited the length of the arrow, and the string attached to a kind of noose. Of a similar con-

struction is the sarra-racca or uttéwacca. The iron point is slightly fixed and attached to a long string, which is neatly wound up round the upper shaft of the arrow; when the fish is struck, it darts into the deep, and the point having detached itself, the line runs off rapidly, while the arrow which swims on the surface points out the situation where the fish is, and the Indian goes in chase with his canoe. This kind of arrow is likewise used for shooting fresh-water turtle, which are sometimes of an enormous size; nevertheless, the force with which the arrow is discharged causes the point to penetrate through the shell. It is only to be wondered at how so large an animal can be secured with so thin a string as that which is attached to the iron point; but I believe, in their skill in landing a large fish or hauling in a turtle, they would not yield to the best angler in England.

The samoro is an arrow of peculiar construction, and three wounds are at once inflicted by it. It is used for striking the larger fishes which frequent the rivers of Guiana.

These are the arrows which are generally in use for shooting fish, but various are the ways used to entrap the finny tribe. An ingenious method to secure fish, without much trouble, is by means of spring-hooks. The Indians take an elastic and tough stick, of the thickness of a finger, to the thinner end of which a hook is attached, while the thicker end is driven in the bank of the river, or perhaps tied to the branch or root of a tree under

water; just somewhat below the surface of the water, a notch is made in the stick, and a similar notch at the thinner end where the hook is attached. The stick is now bent, and by means of the two notches it is kept in that situation, the hook and bait being a little under the water; but scarcely is it touched by the fish, in his eagerness to seize the seducing morsel, when it is not only hooked, but, in consequence of the jerk, the notches part from each other, and the fish is drawn by the elasticity of the rod out of its element, and there it hangs until it is secured by the fisherman.

After we had passed the Christmas Cataracts of the river Berbice, our ill success in securing game would have left us in want, if we had not been indemnified by a large number of fish; and I recollect that our canoemen caught, in one night, fourteen large haimuras (*erythrinus*) by means of spring-hooks. If the fish is very weighty, and the elasticity of the rod or stick not in comparison, the fish is only partly drawn out, and in its attempts to disentangle itself, it struggles and lashes the water, and this is a sign for the fisherman to secure the captive; or the noise attracts the wily cayman, always on the alert to seize some prey, which is soon in attendance, and snaps at the entrapped fish, carrying away hook and line. In this piratical system he is assisted by the pirai or huma, who slashes piece after piece from the poor captive, and when the tardy fisherman takes his round, he

finds nothing but the head attached to the rod. Those who set the hooks must therefore be constantly on the alert.

Spring Hooks.

In the vicinity of their villages, the Indians frequently plant numerous poles along the bank of the river, where it is shallow; these are about ten feet apart, and a line is drawn from one to the other and secured. To this line, which frequently consists merely of a liana, numerous smaller ones are tied, each of which has a baited hook at its end, and thus the Indian, provided he attends to his hooks, has a better chance of securing fish. If a large fish takes the bait, the consequence is that it tears the line, and he not only loses the fish, but likewise a number of hooks.

The Indian employs likewise different shaped baskets, which are made of thin twigs, or of a reed rather flat and held asunder by hoops; some are

cylindrical, others conical, with an opening at both ends; and small sharpened sticks are placed, funnel-shaped, in such a manner that they point inwards, to allow the fish to get in but not out again.

We observed, in the Rio Negro, numerous contrivances at the mouth of small rivers, to secure fish on a similar plan, but on a larger scale. The mouth of the stream is barricaded with high poles, in the following form:

The part *a a* fronts the current, and at *b* there is a narrow entrance, which in a winding manner opens at *c*, in the reservoir *d d*, entirely shut in with poles. The fish coming down the river easily enters the *camboa*, but, as in the former instance, it cannot find its way out again. The poles of which it consists being of considerable height, it serves equally well when the river is swollen; it is entered from behind; and there is frequently a kind of grating at half of the whole height of the camboa, to prevent the fish from sinking in the deep, if the river stands very high. We observed here likewise numerous weirs, called *cacuri*, which resembled those which are employed for taking the sturgeon in the Havel and other rivers of Germany.

A peculiar feature of the rivers of Guiana are large inlets, which no doubt have been formed by the river changing its course. These inlets (*kira-hagh* or *italú*) are narrow at their mouth, but expand considerably when once entered, and are entirely currentless. They are the favourite abode of many fishes, and consequently the haunts of alligators, caymans, and numerous aquatic birds which prey on the finny tribe. The magoari or American stork (*Ciconia Americana*), the jabiru (*Mycteria Americana*), the hanura (*Ardea cocoi*), the roseate spoonbills (*Platalea rosea*), the boatbill (*Cancroma cochlearia*), the pereka (*Carbo Brasiliensis*), the American darter (*Plotus Americanus*), and numerous others, frequent these inlets in search of food.

The Indians, with their families, undertake large fishing expeditions to those which they know to be well stocked with fish; and after their outlets have been partly barricaded, they erect their temporary huts and commence fishing with the line or with bow and arrows. If they are successful, a small triangular or square stage is erected. Should a laulau have been caught, then a square and large *barbacot* is sure to be erected, and the Indian, always willing to spare himself trouble where he can, seeks until he finds two trees which are just apart enough to serve in lieu of poles

The women have been meanwhile occupied in collecting dry wood; and after the fish has been washed and cleaned, and cut in pieces if it be a large one, it is put upon the grating and the wood lighted below it. The smoke acts as pyroligneous acid upon the fish; and this method is more effectual than if the fish had been simply moistened with the acid, as it combines the complete exsiccation of the animal substance with the effect of the pyroligneous acid. The fish thus prepared keeps for several days; nay, if it be well smoked, for weeks. Meat of feathered or other game is smoked in the same manner, and keeps for a longer period. The smoking ought to be, however, repeated after a certain lapse of time.

But the most effective mode of fishing is to poison the water with *hai-arí*, the root of a leguminous plant (*lonchocarpus*), a climber, with a bluish papilionaceous flower. The root is about three inches

in diameter, and contains a white gummy milk of an acrid taste. After a sufficient quantity of hai-arí root has been collected, and the spot in the river has been fixed upon, a large space is inclosed. If it be among the falls where the pacu has its haunts, the ledges of the rocks frequently afford opportunity of lightening the labour of inclosing a spot above where the *lacis* is in abundance, and which plant constitutes the favourite food of that fish. By means of a wall of loose stones, and hurdles made of light wood, the remainder of the barrier is accomplished; two or three spaces are generally left open, for which likewise hurdles are prepared, but which are not closed until they intend to commence to poison the water. These openings are, lastly, closed with daybreak, but previously the hai-arí has been prepared. They beat it upon the rocks with heavy sticks until it is in shreds; and a corial or canoe having been filled with water, they immerse the hai-arí and turn it about, until the water has a milky whiteness. If the canoe is not too large, it is now carried to the spot which has been inclosed, and the infusion is thrown at different spots into it. The first symptoms that the poison has taken effect are observable in about ten or fifteen minutes; the fish rise to the surface, commence to swim unsteady, jump out of the water, and attempt to pass the stone-walls and hurdles; ultimately, they gasp violently for air, the gill-covers remain open, and turning the belly upwards, they die. As soon as the poison has taken proper effect, the fish may be

secured with the hand, or they are shot with the arrow. The fish thus killed are by no means deteriorated in quality, and the number which are caught is enormous. In the Brazil, as at the Rio Negro, this mode of fishing is interdicted under a penalty of two hundred *mil reis*, but it is not strictly kept, nor is the fine enforced.

I estimated the quantity of fish which I saw taken in the Upper Demerara river, during one of those fishing expeditions, at fifty hundred weight. Mr. Hillhouse relates, that in less than an hour he has taken two hundred and seventy pacu, averaging seven pounds weight, with one hundred weight of other fish.

I have seen frequently a peculiar mode of fishing practised among the Indians, when at the period that the water in the rivers fell after the inundation, large pools of water had collected on the savannahs or on the islands. As soon as it was discovered that the pool contained fish, then young and old set to with calibashes, pots, and whatever would serve the purpose, to empty the pool of its water.

The Rio Negro was, at the end of March 1839, on so low a level, that many of its tributaries ceased to flow, and consequently the deeper parts of the bed of the river formed pools. These pools, in the river Anapara, were so stocked with fish, that we rushed with cutlasses into the water and waged war against the finny tribe on a novel method. The number we secured by cutting them in pieces was astonishing.

Among the Arécuna Indians I observed a kind of net which they called *penté*, with which they secured a number of smaller fish, perhaps three to four inches in length, which bury themselves in holes in the banks of rivers. The Indian knocks with the net at the hole, and the alarmed fish rushes out into the net. This is the only instance in which I saw the Indians of the interior make use of a net.

We are too little acquainted with the habits of fishes in general, and even with the modes and periods of propagation of those which inhabit Europe; it is therefore not to be expected that I, during the comparative short period which I spent in the interior of Guiana, should have become acquainted with what has remained in many instances a riddle to the investigating eye of European philosophers for centuries. The general belief among the Indians is, that at the period when the annual rains cause the rivers to overflow and inundate the low countries, the fish ascend to those inlets which the rivers form in their upper parts, and where the water is currentless; here they are said to deposit their spawn. An old Macusi chieftain at Pirara informed me that even the pacu deposited its eggs in those still waters. It is a singular fact, that the fry of the pacu is entirely unknown at the lower regions of the rivers, where the adults feed in numbers on the *lacis* or *waia* and other similar water-plants. Mr. Hillhouse, who so frequently visited the interior, observes, in his "Voyage up the Mascaroony," — "I have caught, by poisoning the

waters, upwards of one thousand pacou, and the fry of other kinds of fish to a finger's length; but in all this wholesale destruction, I have never seen a pacou less than a foot long." * There is no doubt that the fish does not descend the rivers till of a sufficient age and strength to venture among the turbulent waters at the cataracts, where its favourite food, the *waia*, is growing.

A species of fish, which belongs to the same division as the *callichthys*, namely the *Doras Hancockii* of Cuvier and Valenciennes, possesses the singular property, as we are told already by Margrave of his *Tamoata*, of travelling over land. I have been informed by eye-witnesses, that they have met sometimes whole droves during the dry season, when those pools of water which had remained from the last inundation were about to dry up. They then march over land in search of water, and the shields with which their body is armed, as well as the strong spring ray of their pectoral fins, serve to help them forward. It is thought that "they have the power of retaining a portion of water in a membranaceous bag surrounding the gills, which keeps the filamentous structure moist, and enables the animal to continue the respiratory action." † So numerous are those droves, that the negroes have filled sometimes whole baskets during the terrestrial excursions of the doras in search of their natural element.

* Journal of the Royal Geographical Society, vol. iv. p. 33.

† *Vide* Naturalist's Library, Ichthyology, vol. i. p. 72.

Fish are generally accused of having no attachments for their offspring; they neither construct a nest, nor do they feed or defend their young. There are, however, exceptions, and among these belongs the fish which is known at the coast of Guiana under the name of *hassar* or *hardback* (*Callichthys subulatus**), which constructs a regular nest of blades of grass and leaves, in holes just above the surface of the water, where it deposits its roe and watches it with maternal care until the fry is brought forth. Somewhere else I have related the maternal care which the lau-lau and other species of *siluridæ* show for their young offspring, which swim in shoals about them, and in case of danger enter the large throat of the mother.† These are only single instances; the far greater number, when once brought into external life, are left to themselves, and perish, devoured by larger fish, reptiles, or

* I believe that Hancock's *Callichthys littoralis*, or Valenciennes's *C. subulatus*, and Margrave's *Tamoata*, are nearer related than suspected. I am not aware that the *Doras* in the interior built any nests, and refer therefore only to the *Callichthys* at the coast regions or brackish waters.

† I extract from some manuscript notes of Dr. Hancock's, formerly a resident in Demerara, and which only lately have been lent to me, the following confirmation of the above:—A large *gillbakra* (a species of salt-water *silurus*), just taken out of the water, was seen by Mr. Gibbs, and many others at the King's Stelling, to vomit up vast numbers of the young fry of the same species, he thinks three or four hundred, each the length of a finger. The fish had been chased up and taken in shoal water. Something similar has been observed of a *cuirass*, another species of *silurus*.

aquatic birds; and if the survivors should live to increase in size, their safety is endangered for the rest of their life. It is not only man, who for economical purposes pursues the fishes which inhabit the mighty rivers of Guiana, various are their other enemies, which for the purpose of satisfying their appetites wage war on the finny tribe. They themselves, the most voracious and insatiable of the animal creation, assist in their mutual destruction.

The large alligators and caymans are the foremost among the inhabitants of the water which prey upon the fishes. There they lie, like dry logs of wood, at the foot of some cataract, their mouth half open, ready to snatch and swallow what the increased rapidity of the current should carry down the fall. How frequently have we seen them in that situation, while ascending the upper river Berbice, which beyond all others seemed to swarm with these horrid monsters. I have already observed how often they tore the fish from our spring-hooks, and carried fish, hook, and line away; and we naturally did not owe them good-will for their stealing propensities, which served as an additional proof to what extent their depredations must be carried on. And although abundance of fish, during certain seasons, prevails in the rivers of the interior, the cayman is nevertheless the most covetous of all animals, and envies every other successful fisher. This he gives to understand, particularly by angry growls, if the line with the captive is drawn in, and

his attempts to intercept the captured fish, before it be drawn on the land, should have proved unsuccessful. While we were encamped at the mouth of the river Rewa, or Roiwa, during our last expedition, the afternoon of 21st October had passed under thunder and rain; but at the approach of night, Nature lulled herself to rest, and only the droppings from the leaves told of the former storm. I was lying sleepless in my hammock, and I watched two Indians who had their lines out to entrap some hungry fish. A *kilbagre*, lured away by the tempting bait, had snapped at it, and the fisherman, acquainted by the stress on his line of his success, drew the unwilling fish towards the canoe, when the roar of a cayman awoke the echo of the woods, and rushing towards the canoe with all its might, he recaptured the fish, as the astonished Indians were just on the point of drawing it in, and with it went the hook and a great part of the line. At our second night's camp, after we had entered the river Rupununi, the Indians were likewise fishing, and whenever a fish was caught and drawn towards the canoe, the caymans commenced such a roar that it baffled description. We distinctly heard that there were three; first one commenced when the fish that was drawn in began to struggle, and another answered him, until the noise was so great that the Indians, as if in self-defence, and to intimidate the approaching monsters, set up a shout themselves. Indeed, the roaring of the cayman is so strong, that in the still hour of night it may be heard a mile off,—and

there is something awful and indescribable in it; it is not the tiger's growl, the bull's bellowing, the lion's roar; it is different from all, and really terrific, when that sound bursts suddenly upon the ear. I might compare it to the snorting of a frightened horse, if the strength of that snort could be increased ten,—no, twenty-fold, in effect.

The otters of Guiana, of which there are two species, are more destructive to the fishes than the European and Canadian otters to the finny tribes of their rivers. As constant summer prevails in Guiana, their depredations continue the whole year; while, during the period when the rivers of the colder zones are frozen over, the otters there are obliged to feed on terrestrial animals. Old Izaak Walton would have found, therefore, additional reasons to bestow hard names upon those "villanous vermin." Every rock in the vicinity of their residence bears the mark of their excrements; and their feeding-places are so devoid of vegetation, if we except the larger bushes and trees, that they cannot be mistaken, even if the number of scales and fish-bones did not point out their success and frequency of their visits. A complete path leads up from the water's edge to these places, which, in consequence of their ascending and descending in single file, is hollowed out. The smaller species of otter hunt in packs of eight or ten, and they swim mostly against the stream; the larger, seldom more than two together. As they dive to a great distance, and are able to remain under the water

for six or eight minutes, what fish passes over them at that time are sure to fall a prey to their voracity; they seize them at once by the belly and drag them on shore, where they are frequently deposited while they continue their pursuit. The Indians, who are aware of this, watch their success in ambush, and secure what the otters have brought ashore. The *arapaima* or *pirarucu*, the largest fresh-water fish of those regions, is not safe from their attacks; and I have been informed by the Indians, that this giant of the rivers is sometimes attacked by the otters *en masse*; so much I know from personal observations, that they secure *haimuras* (*Erythrinus*) from ten to twelve pounds in weight.

Even the jaguar, the tiger of the new world, is ranged among the depredators upon the fishes; and as every Indian will inform the inquirer, his attempts to take fish prove successful. He may be seen frequently prowling on sand-banks or along the low banks of rivers, and as the fish approach the shallows, he dexterously knocks them out of the water with his paw; but, that in order to entice them to the surface, he drops some of his saliva on the water, is no doubt an assertion which wants confirmation. I have been astonished at the feats of strength which a jaguar displayed in one of his fishing depredations. While we were sojourning at Curassawaka, a settlement of Caribs on the Rupununi, we were much annoyed by a jaguar which prowled almost nightly about the settlement. One evening the Indians, who had been out fishing,

returned with a large arapaima or pirarucu (*Sudis gigas*). As it was late, and the fish weighed not less than two hundred pounds, we deferred conveying it on land until next morning. When morning came, no fish was to be found in the canoe; but there were sufficient traces to show that it had been dragged by the jaguar into the wood, where we found it *minus* its tail part, which to a third of the fish's length had been eaten off. It may be conceived what strength was necessary to get it out of the canoe; and I am almost inclined to think that it had been assisted by another jaguar.

How numerous are the enemies which the fish possess amongst the winged tribe of Guiana! If we consider their number, from the pygmiest of the kingsfishers, scarcely the size of a sparrow, to the stately jabiru,* which with his neck erect stands upwards of six feet high, it may be easily imagined how many perils the finny tribe have to undergo, and that perhaps scarce one in a thousand of those which are excluded from the egg dies of old age.

Look at the *hanura* (*Ardea cocoi*), alike distinguished, like its European prototype the heron, for cowardice, indolence, and insatiable hunger. There he sits on yonder tree, which partly overhangs that broad expanse of water, named a *kirahagh* or *itabru* by the Indians, his long neck sunk between the shoulders, and his whole figure bespeaking lean-

* Mycteria Americana.

ness, though gorged with prey, as if there were not abundance for his support. But let the call of hunger remind him that exertions are wanted to satisfy his unnatural appetite, and we soon see him upon the wing or wading solitary along the shallow waters, until he finds opportunity to dart with unerring aim upon his prey; or he awaits patiently the smaller fry, which, driven into shallow water, have only escaped the danger which the larger species of their own kind threatened them, in order to be devoured by the voracious bird.

Numerous are the different species of bitterns and smaller herons which aid in committing devastation among the fishes; they are assisted by the roseate spoon-bill, the boat-bill, * and, of all others, by the cormorants and the darters, or *carara*. † The latter are worthy companions of the hanura; alike indolent and voracious, they share in all its depredatory habits, having moreover the advantage that they can fall on their prey in the deep. The carara, as well as the cormorant, is an excellent diver; the peculiar formation of the nasal organs of the former qualify it particularly to remain for a length of time under water.

Large flocks of gulls, chiefly that strange species the *darradarra* or razor-bill, ‡ frequent the inland rivers; and although the peculiar formation of their bill gives to them an awkward appearance, scarcely

* Platalea ajaja, Cancroma cochlearia.

† Carbo Brasiliensis, Plotus Americanus.

‡ Rhynchops melanura.

are they on the wing when they show their agility, and soaring over the water, slightly dipping their wings in that element, they are skilled enough to stay the smaller fish in its gambols, and carry it away an easy prey.

Frequently resounds the gloomy forest from the piercing cry of the fishing eagle, which, soaring in circles high above the water, darts with the swiftness of an arrow upon the fish which played on the surface of the river. He who would make himself acquainted with the numerous enemies which the fish possess among the feathered tribe, ought to be present when the waters, in one of those inlets or kirahaghs, are poisoned with the hai-arí plant. Scarcely commence the torpid qualities of the plants to operate upon the fish, which, penned in, cannot escape its pernicious influence, and, snapping for air, show themselves on the surface, when the environs already resound from the shrill cry of numerous gulls, which, not minding the presence of man, dart between them upon the helpless fish, and seem equally intent upon their destruction. The trees are occupied by herons, maguaris,* darters, and perekas,† which only await the absence of man to assist in the work of destruction. The king of the vultures‡ and his sable attendants, § in anticipation of the approaching feast, when those fishes which were neglected to be taken up by the Indians or aquatic birds should have acquired the neces-

* Ciconia Americana.
† Carbo Brasiliensis.
‡ Sarcoramphus papa.
§ Cathartes aura et solitaris.

sary goût, sit around in solemn silence, and their head withdrawn in the ruff, their wings partly drooping, they convey the very picture of gloomy scavengers. But if I were to judge from a living specimen which had been entrapped in an adult state, and which I possessed for several weeks while in the interior of Guiana, I would not be astonished to see the king of vultures, when hard pressed by hunger, regaling itself on fresh fish. The individual to which I allude never declined to eat the fish which was thrown in a fresh state before him; for that purpose, he kept his food with his talons, and spread his wings, picking the flesh from the bones if the fish was large, but swallowing it entire if of a small size. *

We thus close the long list of enemies which the finny tribe of the mighty rivers of Guiana possess; but if we consider the extraordinary fecundity of fish, it is not to be wondered at that there is still such an abundance as to afford nourishment to man, to whose sustenance the whole creation has been made subservient.

Such of the Guiana fresh-water fishes as might prove of economical use to mankind are exceedingly numerous. The many noble streams of these fertile regions are in general stocked with fish, although at present they profit only a few. At the period that the inundations subside, and the granite dykes which cross the rivers of the interior are no more covered by the waters, parties of men proceed from

* Annals of Natural History, vol. ii. p. 259.

the lower Essequibo to these dykes in order to procure the fish called pacu, which are caught in large numbers, slightly salted, and dried on the rocks, and sold at the colony at about a shilling each; however, I do not think that fifteen hundred are brought at present to the coast. The *morocoto* or *osibu*, a species which belongs to the same division of fishes as the pacu, frequenting only the estuaries of rivers, chiefly those of the Orinoco and the adjacent streams, while the pacu belongs exclusively to the fresh-water rivers where the tide has no influence, is likewise much prized as an excellent article of food, both when fresh or salted, and large numbers of them are occasionally brought to Georgetown. If the fisheries were carried on in a more active way, and not as a pastime, or merely on a tour of pleasure to give some change to a monotonous and indolent life, it would not only become productive of considerable benefits to those who embark in it, but open another resource of the colony, which at present lies entirely neglected. Of great importance is the fact, that there exists in the Rupununi one of the largest fresh-water fishes, namely, the arapaima or pirarucu, which attains occasionally a length of twelve feet, and weighs upwards of three hundred pounds. It is used fresh and salted, and affords the means of subsistence to a large number of inhabitants on the Rio Negro and the Amazon, which it likewise inhabits. Were the fishing-ground on the Rupununi attended to during the dry season, an abundance of that fish might be

obtained for internal consumption and occasional traffic with the coast regions. The lau-lau reaches nearly the size of the arapaima, and as it belongs to a division of fishes, the air-bladder of which is used with the same advantage as that of the sturgeon, in lieu of isinglass, it might be collected in sufficient abundance; besides that, its flesh is considered excellent, and its lard, like that of its congener in Europe (*Siluris glanis*), might be employed as that of the hog, or would yield a considerable quantity of oil. If we consider that pilchards alone are exported from Great Britain to the annual amount of £ 50,000, principally to the West Indies, along with herrings and mackerels to a much larger amount, for the use of the labouring population, it forms rather an important point to one of those colonies which contribute to the consumption of that kind of nourishment, that its own rivers abound, if not in the same, at least in similar articles of food.

There are many other species of fish which are highly esteemed for their flavour, and vie in delicacy with our most esteemed European fish; I name only the delicious lucunani, the haimura, the cartabac, the bashaw, paiara, and numerous others which are described more in detail in the following pages. Indeed, in whatever view we may regard Guiana, the first description which Sir Walter Raleigh gave of that fertile province, if we except his bestowing wrong names on such animals as he compared with those of the old world, it is still stamped with truth. "There is no country," he saith,

‘ which yieldeth more pleasure to the inhabitants, either for those common delights of hunting, hawking, fishing, fowling, and the rest, than Guiana doth. It has so many plains, clear rivers, abundance of pheasants, partridges, quails, rails, cranes, herons, and all other fowl, deer of all sorts, porkers, hares, lions, tigers, leopards, and divers other sorts of beasts, either for chase or food.”

THE

FISHES OF GUIANA.*

DESCRIPTIONS.

From the foregoing Memoir and Introduction, it will be understood under what circumstances the materials which are about to be described were collected; and in bringing them into notice, the Editor has had in view the publication of a Volume, which might be useful, and prove in some measure a guide to other Ichthyologists, travelling upon the rivers in similar or adjacent districts in South America. Mr. Schomburgk, when starting upon his journeys to the interior, and at a distance from European communication, felt much the want of

* Although we have given the above title to the Volume, it must be understood that there are several species described which have been taken beyond the boundaries of Guiana. These are, however, all noticed as they occur, and we trust will not make any confusion in the list as that of a local fauna; occurring in the Schomburgk Collection, they could scarcely be omitted.

some work where the generic characters were given; while the great expense of such as have appeared since his first expedition, would have rendered them far from accessible, even if they could have been forwarded in time. As that gentleman has stated at the commencement of his Introduction, no intention to publish his materials was contemplated, more particularly as few of the specimens themselves had been brought to this country; yet upon looking over his drawings and the accompanying notes, so many curious forms presented themselves, different from those figured by Humboldt, Spix, or in the later work of D'Orbigny, that it seemed wrong to withhold them; while it would also have concealed from the public the labours of our traveller in this department, which, under the circumstances, have been very considerable: our views of the importance of the collection is also borne out by the appearance of the fifteenth volume of the work of M. Valenciennes, devoted to the Siluridæ and Loricarinæ,—and even from this, containing, it is to be presumed, the very latest information, many of our Guiana species seem to be wanting. The collection will be still more enhanced in value, when it is known that it has been procured entirely from the fresh waters or from the rivers, a considerable part of it at a distance of many hundreds of miles from the sea, and in regions never previously visited by the naturalist. We shall thus be enabled to compare the forms with those in the rivers of the other great divisions of the world; not

that we consider the list by any means complete, for in such an extent of waters we have no doubt more than double the number of species exist, yet it may be presumed that specimens of the prevailing kinds were obtained. The drawings from which we have wrought were made upon the spot from the newly killed fishes, and are on this account most important, as giving the fresh tints of colour which it is impossible otherwise to carry away. They have been quickly executed, but possess evident marks of being very characteristic and correct, wherever specimens for comparison have accompanied them,—at the same time, minuteness of execution and of the details of scaling, &c., as might have from circumstances been anticipated, are wanting; and here has lain our greatest difficulty, from these circumstances it has been impossible always to fix to our satisfaction the proper station of the fish, but in all cases where this occurs, the uncertainty is stated, and the species placed as near as can be ascertained to where its true place should be. In arrangement we have followed no regular system, but have preferred keeping the families separated, and at the commencement have placed the Siluridæ, as being characteristic of these rivers. The sub-family,

LORICARINÆ,

or mailed cat-fish, may be first noticed; several of the genera which will range here are preserved in the Schomburgk Collection. These are most

remarkably characterised by the strength of their external coverings, whether it be developed in the form of spines or plates. The dorsal and abdominal plates are connected with the vertebral column and move with it, or they are mutually dependent; in some degree the skeleton becomes external, and supports or assists the weaker arrangements which in these cases prevail internally. They inhabit the fresh waters of the new world, attaining an elevation of five thousand feet, and in nearly all the species the mouth is placed underneath, is used as a sucking apparatus for attachment to rocks or trunks of trees, and the teeth are numerous but minute, and have more the appearance of hooks than true teeth. They swim near the bottom, and sometimes leave their element to advance by the rocks on the river side, in which they are assisted by the strong spines of their pectoral fins; and for this purpose also they are endowed with a power of lengthened vitality.

ACANTHICUS.

The first fish to which our attention will be directed is one of a very remarkable form among the single finned *Loricarinæ;* it belongs to the genus *Acanthicus* of Spix and Agassiz, * but in the last volume of the "Histoire Naturelle des Poissons" it has been included in the genus *Rhinelepis*† of the same authors; and although we have retained the generic name, we must acknowledge that

* Ἀκανθικος, spined. † Ρινε, file; λεπις, a scale.

the distinctions which are given in the *conspectus generum* of the Brazilian fishes are minute, and consist almost in the abdomen of the one being naked, while in the other it is covered with minute scales. M. Valenciennes appears to consider the *Acanth. histrix* of Spix to be distinct from the species originally described by M. Vandelli, for which he retains the name, giving the other under the title of *Rhinelepis acanthicus*. The drawing and specimen before us agree best with the true *A. histrix*, that of Vandelli, and as such we provisionally keep it. The outer rays of the tail are represented in the drawing not at all elongated, and do not appear to have been so in the specimen, though it is a little mutilated. The group of bristling processes before the opercula are much stronger and more elongated, so also is the armature of the first ray of the pectoral fins, and the distribution of the spines on the plates of the sides agree with the description of Valenciennes. On our first Plate, then, we have endeavoured to give a figure of it, adding previously the generic characters from Agassiz.

ACANTHICUS *Spix*.—"Totum corpus aculeatum; truncus scutis osseis, crassis squamiformibus, distinctis tectis; abdomen non scutatum. Dentes bisinflexi per series radiatas (nec circulares) dispositi. Velum labiale circulare. Pinna dorsalis unica."

RHINELEPIS *Spix*.—"Totum corpus limatum; truncus scutis majoribus, imbricatis; venter scutis minutis discretis tectis. Dentes radiati, apice hamati, primus bisinflexus, apice fissus. Labium inferius solum velatum, labium superius cirrhatum. Pinna dorsalis unica."

PORCUPINE ACANTHICUS.

Acanthicus histrix.

PLATE I.

Le Rhinelepis porc-epic ; Rhinelepis histrix, *Valenc.*, l. xv. p. 486. Loricaria histrix Vandelli, (*auct. Valenc.*).

The very remarkable appearance of this fish will strike any observer, and from all our knowledge of the habits and nature of the Loricarinæ, we are unable to see for what purpose their strong plates and armatures are intended. In Acanthicus, the spination of the plates and fin-rays, indeed of every part of the body, is carried to the utmost extent, and in general appears as if intended both for offence and defence. The tufts of strong spines anterior to the opening of the gills, and which appear to be moveable, together with the spines of the pectoral fins, may serve for two purposes, either that which M. Valenciennes attributes to somewhat similar tufts in Hypostoma, which he thinks are used in assisting to support themselves against strong currents, or, in the fish before us, to disturb or rake up the sand or mud at the bottom of the rivers, where they lie in watch, and in this way insidiously

conceal themselves from prey, or they assist to seek and raise up small insects or aquatic worms which may either serve as a lure for other fishes or be taken as food.

Mr. Schomburgk remarks, "I am sorry that I do not possess more materials for the description of this remarkable fish, which was caught during my absence. I had heard of the existence of this species while sojourning at Fort San Joaquim, and when the spiny ray, which follows herewith, had been given to me, I almost doubted that it could come from a fish; however, a young specimen was secured afterwards, but, as already observed, during my absence, and the necessary notes were not taken to make its description more perfect. They are said to grow from three to three and a half feet long, and are found in holes, or under the roots of trees which have fallen in the water. They are said to be peculiar to the Rio Branco, and the Indians who inhabit its banks eat its flesh and name it *uacari*. It differs in many respects from Spix's *Acanth. histrix*." These observations are to a certain extent by D'Orbigny, who, in speaking of a species of his Rhinelepis, says it lives in rivers with a sandy bottom, and is often concealed below stones, leading a quiet and peaceable life. *

The specimen above alluded to, brought home by Mr. Schomburgk, is about thirteen inches in length, but the size obtained, as observed, is much greater; the first ray of the pectoral fin of the

* Quoted from Valenciennes.

large fish is nearly seven-eighths of an inch in diameter, and has the spines two inches and a half in length. The spines appear to be jointed on, and have the lower part enclosed in the dark coloured epidermis which covers the trunk of the ray. They all terminate in a brown crooked point, are tubular, and in their dried state are hard and elas-

tic. The whole body and rays of all the fins are covered thickly with spines or points, more or less developed. They are strongest on the snout and

sides, and on the latter assume the arrangement of three lines running along the centre of the plates; two lines also appear on the dorsal aspect between the dorsal fin and the tail, which diverge at the insertion of that organ upon its sides. A similar arrangement takes place on the lower side of the body, which causes the lateral view of the caudal extremity before its insertion, or the commencement of the fin, to appear as having five rows of spines. On the abdomen the spines or studs are distributed in insulated parcels of from four to ten or twelve in number. The spines of the opercular tufts are at the longest part about an inch long, shorter on the lower and frontal aspect, and bending slightly downwards. The first ray of all the fins is very broad and strong, and these organs are very considerably developed. The tail exhibits none of the lengthened or filiform appearance represented in the figure in the Brazilian fishes, of which we add a reduced copy, but the outer ray of the lower lobe is

rather lengthened, as we shall see is frequently the

case in Hypostoma; this elongation, however, we believe in some instances to be sexual, and until this is ascertained, a high specific value should not be put on this as a character. The mouth is placed completely underneath, and appears as if it was capable of being applied to any flat substance, so as to cover closely a minute prey. When expanded in the dried specimen, it is of a rounded oval form, having a short barble or cirrhus at each angle. The teeth on both jaws are thick set on slender stalks like wool-cards, with the tips hard, brown, bifid, and bending inwards. The general colour of the dried specimen is of a yellowish brown; the spines yellowish white tipped with reddish brown, those most elongated dark towards the base, from being there covered with an epidermis which runs upon them for nearly half their length in their present state, though in a fresh condition it may extend much farther. The formula of the fin-rays is

P. 1/6—V. 1/5—A. 1/4—D. 1/8—C. 2/14.

The genus Rhinelepis, as described by Valenciennes, will contain three species in addition to the two alluded to in the above description, and which are the only ones known where the armature is so formidable. These three will stand in Rhinelepis proper, and are *R. strigosa*, Valenc., which will ally the genus to Loricaria by the mouth being placed near the anterior extremity of the snout,

cleft across, and instead of a surrounding membrane, has only a single narrow fold at the angle of the ower lip. This fish was found by D'Orbigny in the Parana and other rivers of the province Corltientes, particularly in those having a sandy bot rom.—*R. aspera*, figured and described in Spix; and *R. genibarbis*, Valenc., distinguished from the others by a tuft of hairs or slender spines, stiff and thick, which are placed on each side of the oval space below the operculum.

The only other indication of a fish belonging to the Loricarinæ possessing a single dorsal fin, is represented in a rough sketch forwarded among a few drawings which Mr. Schomburgk has marked, "Not executed under my superintendence, and for the correctnesss of which I cannot vouch." In its lengthened form and snout it resembles the *L. rostrata* of Spix, but the under jaw is cirrhated, as in the *L. cirrhosa* of Schneider, which, however, Valenciennes has placed as a synonim to his *L. cataphracta*. In the work of Schneider* we have the two species described, and both are marked as existing in the museum of Bloch. According to that work, our sketch would represent *L. cataphracta*, the upper lobe of the tail not being elongated; but this character is given by Valenciennes to the other, and as we remarked in the description of the preceding fish, may be of uncertain value; as it stands, it is possible that two species may even yet be confounded; and we have introduced the subject here

* Page 125.

to direct the attention of future travellers who may have opportunities of investigating the subject in the South American waters. It should be noticed, that although the specific characters given by Schneider are very close to each other, in that of *L. cirrhosa*, "*thorace inferius squamato*" seems of importance.

Formula of the fins of *L. cataphracta*, given by

Schneid. P. 1/7—V. 1/6—A. 5 — C. 16—D. 8 1/1.
Valenc. B. 4 — D. 1/7—A. 1/5—C. 10—P. 1/5—V. 1/5.

L. cirrhosa, given by Schneider,

B. 4—P. 1/7—V. 1/6—A. 1/6—C. 12—D. 1/8.

The habits of Loricaria have not yet been detailed, nor their anatomy described. Nine distinct species are described or indicated by Valenciennes, and figures of three of these have been given as new in the Atlas to D'Orbigny's Voyage (pl. 6); only one, the *L. cataphracta*, is noticed as occurring in the waters of Guiana.

HYPOSTOMA.

The next form in the Collection which will receive our notice is the genus HYPOSTOMA, *Lacepede*, of which Mr. Schomburgk has brought three species, two of them apparently different from those described in the last volume of the "Histoire Naturelle des Poissons," by Valenciennes. Three sub-

divisions have been made in the genus; the first with the body thick and short, and the head disproportionally large;—where the angles of the plates become less developed, and the head becomes depressed;—and the last, where the inter-operculum is very moveable and is furnished with tufts (as in *Acanthicus*) of rigid spines which can be displayed at will; when at rest, they are concealed in a furrow or hollow. Of these we have now examples of two, the first and the last. In their outward structure we have a prevalence of the spination and rough armature which seems so remarkably developed in this tribe of fishes, and in them we also see the first trace of the double dorsal fin, analogous to the adipose among the Salmonidæ, but differing in the spinous defence which is placed anterior to the membrane. In the habits of *Hypostoma*, as intimated by D'Orbigny, we have a confirmation in many parts in the short notes with which we have been favoured by our own traveller, and which will be stated in the descriptions of the fishes to which they refer. "These fishes (Hypostoma) are always found in the places where the current is most rapid; they conceal themselves in numbers under stones and in the clefts of rocks, and attach themselves there by the suction of their lips, or they fasten themselves on by the hooks of their opercular spines so strongly that it is easier to break them than to tear them off; when touched, they erect their spines to defend themselves. They swim with rapidity, and *often with the back undermost*,

(" c'est souvent sur le dos qu'ils nagent"). They feed on worms, and spawn in September, eggs which are attached to the rocks by a gluten." * Again, in speaking of the Hypostome de Commerson, which occurred in the whole courses of the Parana and the Uruguay, " they never quitted the stony or rocky parts of the rivers, and when the waters fell they are taken in holes or under insulated stones; at Corrientes they squatted among the rocks. Their movements are lively, but always at the bottom; they keep in shoals, and deposit their spawn in the month of September, in the clefts of rocks." † The first species we have to describe belongs to the more ordinary form of the genus, with a deep body and large head, but is entirely without the pre-opercular spines. It appears to be the *plecostomus* represented in Gronovius, tab. iii. figs. 1 and 2, although it differs slightly from that figure in the form of the tail, which has no elongation of the outward rays, and has the lower longer than the upper. We keep it in the mean time as,

H. PLECOSTOMUS, SPOTTED HYPOSTOMA.—L'Hypostome plecostome, *Valenc. Hist. Nat. des Poissons*, xv. p. 489.—MACUSI name, Yau-ura. *Schomb. Drawings*, No. 66.—Mr. Schomburgk's notes inform us that this fish was found in April in the Rio Branco under the roots of trees, that it was retentive of life, and that the intestines form many

* Quoted from Valenciennes, xv. p. 513.

† D'Orbigny, quoted by Valenciennes, l. xv. p. 497.

flexures but possessed no appendices. Specimen in the Collection eight inches in length to the extremity of longest caudal ray. The whole body rough, with rather minute hard studs, which are elongated only on the extremity of the first pectoral ray and on the centre of the plates. The plates covering the body, with the exception of the abdomen (anterior to the anal fin), are rounded, somewhat sub-angular, and on their posterior margins at first sight appear crenated, from the points of the studs or small spines projecting over. On the centre of the three first rows of plates, counting from the dorsal fin downwards, the points or studs are lengthened and form three lines to the tail; a fourth arises opposite the opercula, but is lost about two-thirds of the length from the extremity. On the part of the abdomen without plates, the studs are arranged in parcels of irregular form, which gives the appearance of a minute plating. The head in its form is somewhat triangular; on the snout there is a central rounded ridge, which is lost between the nostrils and eyes, but again becomes more prominent, running into the first plate upon the back in a rounded point; from each nostril, above the eyes, there is an elevated ridge, which by the form that it gives to the sides of the head reminds us of the Gurnards; in every part it is closely covered with minute studs, very slightly lengthened on the side of the operculum. The mouth is triangular, and of smaller dimensions than in some of the other species; the teeth are also stronger, and are set in a

single row around; the surrounding lips not much developed for sucking, and furnished at each angle with a cirrhus very short and slender. The fins have the first ray all strong; the first dorsal fin is proportionally large and much developed; and the tail is lunated, but with the lower lobe considerably elongated. The formula of the fins are,

Schomb. Spec. D. 1/7—P. 1/6—V. 1/5—A. —C. 2/14.
Valenciennes. D. 1/7—P. 1/6—V. 1/5—A. 1/5—C. 16—Br. 3.

The colour represented in the drawing is a greenish yellow, paler beneath, and having the former colour prevailing entirely on the lower surface of the fish and on the stronger rays of the fins; the whole body is covered with black spots, of considerable size upon the fins; the eyes are coloured yellow.

SHARK-TAILED HYPOSTOMA.

Hypostoma squalinum.

PLATE II.

Carib name, Warra-warra; Macusi, Morutta; L. Geral, Uacari. *Schomb. Drawings and MSS.* No. 15.

"This fish is found in the Rios Branco, Negro, and Essequibo; it lives under the roots of trees and among rocks; and they issue from their hiding-places to the sand-banks to feed at night. The body and head are covered with a scaly armour, the former armed with small spines; the head is flat; lips fleshy, and formed for sucking; teeth fine and moveable, to allow the sucking apparatus to lie flat on the trunk of the tree or whatever they wish to hold by; the pectoral spiny rays are covered with numerous small spines; the outer rays of the caudal fin are semi-spiny and covered in a like manner, and all the rays are rough. The colour is greenish brown, spotted all over the body with black; the fins lighter and webbed with blue; the under parts of the fish are yellowish white; the eye is like as if it had been gilt, and much resembles that of a frog. They are eaten by the Indians, and are considered good and fat. One which was kept alive a day in water ate boiled rice: I suppose their principal food is vegetable matter."

The above notes accompanied Mr. Schomburgk's specimen and drawing, and we do not find any description by Valenciennes which will accord with them. The specimen before us is in length thirteen and a quarter inches to the extremity of the lower or longest caudal ray, to the end of the upper twelve inches, and is considerably depressed in form, particularly in the shape of the head; the upper part of the body is rounded, slight angles appearing, and forming lines where the centre of the plates are marked; the lower row of plates running from the opercula, are however, much angulated, show a distinct line, and towards the tail, lie at nearly right angles, causing the lower surface of the body to appear much flattened. The head is much depressed, between the eyes it is nearly flat, but in the centre of the occipital plate rises into a narrow ridge before joining the first dorsal plate. The whole is rough, but not spined; but before each opening of the opercula there are a few short spines placed in a tuft, and indicating the approach to the structure we shall see in the next fish. The plates upon the anterior part of the body are rounded on their edges, but as they reach the tail the outline becomes angular; they are rough on the edges with short spines, and towards the tail the angle becomes marked with a longer spine, the others on each side gradually shortening. The lower parts of the body anterior to the anal, and within the insertions of the pectoral and anal fins, is thickly studded over with minute points, separated into groups, and

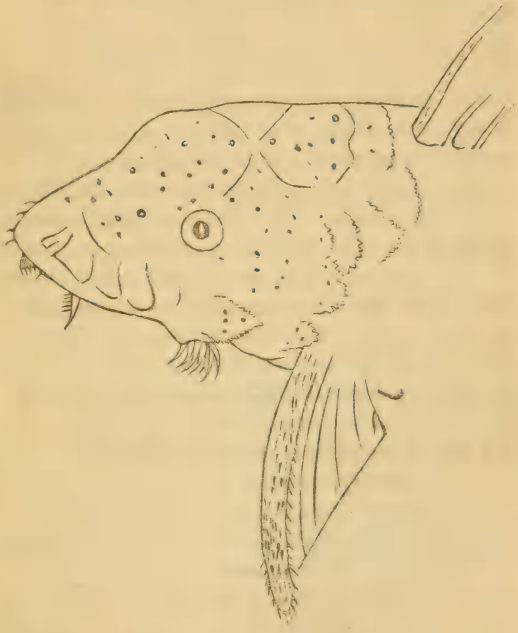
having the sharp points of each of a deep brown colour, so much so as to influence the tint of the part. The mouth is rounded, and is furnished with a large labial disk, having at each angle a cirrhus of about three-eighths of an inch in length. The teeth are fine, sometimes notched at their cutting points, and are placed upon moveable stalks. The whole body above the angular line running from the opercula to the tail is spotted over with black or brownish spots, more minute and thicker on the head, and appearing very conspicuous between the membranes of the fins, where they have a brown appearance and are of a larger size. The development of the fins is considerable; all the rays are rough; the first ray of the pectoral fin armed towards its extremity with spines fully a quarter of an inch in length, apparently having the same structure and crooked tips as in *Acanthicus*. In the caudal fin the rays are strong, those on the outsides powerful; the lower exceeds the upper in length by at least one-half, and is strongly spined at its extremity.

Formula of the fins is,

D. 1/7—2d D. 1—P. 1/6—V. 1/5—A. 1/4—C. 2/12.

No. 68, Schomb. Drawings, represents another small Hypostoma, which we do not refer to any described species; it belongs apparently to the second division, or to those with a tuft of spines upon the inter-operculum.

HYPOSTOMA PUNCTATUM, SMALL BLACK-SPOTTED HYPOSTOMA.—WARRAU name, Uassi; MACUSI, Karuasse; L. GERAL, Uacari. *Schomb. Drawings*, No. 68.



The short notes attached to No. 68 inform us that the specimen represented was taken in the Rio Branco in the month of April, and that it possessed

a long " vivaceousness." It was a female, the roe being double, and occupying one-half of the length of the cavity of the abdomen; the ova large. No food was found in the stomach; the intestines form many flexures, but have no appendices. The air-bladder long. Formula of fins given :—

D. 9—C. 15—A. 4—V. 1/5—P. 1/6.

The drawing, of the natural size, is in length six and a half inches to the end of lower caudal ray, and is coloured entirely of a dull olive-green, slightly paler beneath, dotted over with small black spots. The eyes red. The cirrhi springing from the angles of the labial disk are represented as ciliated or fringed on one side, and on the nose there appears to be six short barbules, as represented in the annexed cut. The inter-opercular tuft is represented about half an inch in length. The plates on the body are crenate on their edges, and of an angular outline. The lower ray of the tail longest, but the fin or membrane runs straight between the tips, without any junction or curvature. In addition, we possess a specimen of a fourth Hypostoma somewhat allied to the above, but more depressed in form, and in its dried state without any appearance of the black dots; it also agrees in many respects with the *H. barbatus*, Valenc. xv. p. 506, though wanting in the development of having processes on the head and gill-covers; it agrees, however in the under parts being without plates or studs of any kind. We give it now as

HYPOSTOMA BARBATUS, BEARDED HYPOSTOMA.—L'Hypostome barbu, Hypostomus barbatus, *Cuv. et Valenc. Histoire Naturelle des Poissons*, xv. p. 506.

Length of our specimen six inches and a quarter, to the lowest ray of the tail. The form is depressed, particularly that of the head, and the body is nearly without angles, a slight one appearing opposite the opercular openings, where the last plate of the sides joins the skin of the abdomen. The head is thickly studded over with short spines, sharp and bending backward when viewed through a glass, yet scarcely giving the appearance of "une barbe mal faite," as indicated by Valenciennes. The inter-opercula are furnished each with seven or eight spines, bending and gradually decreasing in length forwards, that farthest back standing alone, and nearly half an inch in length. The plates on the body are rounded on their posterior edges, except the four or five first in a line from the opercula, which show a blunt angular outline towards the tail, gradually becoming rounded; they are covered with points which assume the form of lines, each terminated with a sharp spine, which gives a ragged outline to the margin of each plate. The abdomen is entirely smooth and without plates. The mouth and labial disk are rather large, each angle of the latter furnished with a very minute barbule; but on each side of the mouth there is also two minute barbules or tentaculi. Rays of the fins all rough, those of the pectoral fin becoming strongest towards the tip; but a series also runs in a continued row

along the upper margin, and which seems to be a characteristic mark of the other rays of the same fin. The caudal fin with the lower ray much longest, the web with no sinuation. The colour of this fish seems to have been of a yellowish green, the lower part, or that wanting plates, of a browner tint, or apparently very similar to the same part in the *Cotti* of our British seas.

Valenciennes has described another species under the name of *H. duodecimalis*, procured in the river St. Francis in Brazil, and considers it identical with the *H. edenticulatum* of Spix, and with the *H. multiradiatus* of Dr. Hancock. We notice this, as, if Valenciennes is correct, the species may be added to the Guianese fishes, and is known by the provincial name, among the Warrau Indians, of *Guasiquitu*. Dr. Hancock's fish is said to frequent lakes, living on the slime, and laying its eggs in holes which it forms in the borders of the lakes. *

The late volume by Valenciennes contains the description of nineteen species of Hypostoma, nine belonging to the ordinary form, and ten to those with spined opercula. Only one in Mr. Schomburgk's Collection can be referred to any of these, and we have little hesitation in adding three to the list, and still less in thinking that the rivers of Guiana will yet furnish a rich harvest to any one who will investigate the history and habits of the Loricarinæ. We have noted all that is known of the habits of the genus we have been examining,

* Zool. Journ., iv. p. 247.

but with the exception of the species which was observed to eat boiled rice, we are ignorant what is their food, or the manner in which they seize it; in all those dissected, the stomach has contained either nothing, or has been filled with mud. * It would be curious to know, also, how the opercular spines or brushes, and the strong armature, which is nearly confined in its development to the pectoral fins, are employed; and whether the conjectures which have been already hazarded are in part correct. In one species lately figured by D'Orbigny (*H. cirrhosus*, Ichth. pl. 7), the snout is armed with a long tuft of these spines, but which appear to have a structure somewhat different. "Son museau est revêtu d'une peau molle et douce qui reste lisse dans la jeune age. Plustard elle se herissè de filamens charnues, plus ou moins montreux, plus ou moins branchus selon les individus ou meme selon les eaux ou ces poissons vivent." † Are these fishes preyed upon by any particular class of animals?

Of their anatomy we also know little, and in some parts it seems peculiar. In the *H. verres*, Valenc., a species from Cayenne, that naturalist remarks that the liver is flattened, rounded, and not large; it is placed beneath a stomach, of which the membranes are very delicate, but which, when inflated, becomes a large pouch, the one-half bending to pass into a separate branch leading to the intestine. The alimentary canal becomes very remarkable and unique among the Siluridæ; the diameter is very narrow,

* Valenciennes. † Valenc. xv. p. 312.

but its length equals that of twenty times the length of the body. * In a Hypostoma mentioned by Dr. Hancock, the stomach ended in an intestine, which, in a specimen about eight inches long, measured twenty-four feet in length; it was most accurately coiled up like a rope, in a great number of convolutions, with the liver disposed in the centre of the coil. Nothing but mud was found within. † This structure, as connected with the food of the whole family, may be interesting to investigate further. The branchial circulation and arrangement would also be an interesting part of the anatomy; and as they all appear to possess to a considerable degree the power of subsisting out of their element, and also to live freely in pools, or even a vessel, experiments while resident at a station might not be very difficult to be carried through.

The characters given in the *conspectus generium* of Spix are—

"Hypostoma.—Corpus subangulosum, scutatum. Abdomen alepidotum. Dentes sub-radiati, apice hamati. Velum labiale circulare, papillosum cirrhatumve, aut papillosum et cirrhatum. Pinnæ dorsales duæ, postica radia unica simplici crasso."

CALLICHTHYS.

Drawings of two species of Callichthys occur; one has been marked *C. longifilis*, Hancock, but it scarcely agrees exactly with the description of that fish, or with the species bearing the same name

* Valenc. xv. 495. † Zool. Journ. iv. 7. 247.

in the work of Valenciennes (xv. p. 317). The provincial names given are in the L. Geral *Tamoatta*, which appears more to be a family name than specific, we find it given also to the second drawing, and so long since as the time of Margrave it seems to have been applied to *C. asper*, Valenc. *Kariwau* is that applied by the Macusi Indians.

Callichthys, No. 22, Schomb.

Mr. Schomburgk gives the following notes regarding this fish. "Inhabits pools, marshes, and creeks; grows sometimes eight inches in length; is capable of living a long time out of water, and migrates from one pool to another in dry seasons overland: they are very fat, and a good viand. The whole fish is completely covered with armour,

except a small portion of the belly, of a greenish brown. The pectoral fins serrated; mouth fleshy; teeth, a single row; caudal fin nearly even; eyes placed near the snout, dull brown; intestines form many flexures. It is of a uniform greenish brown colour, and can exist in muddy holes without any water whatever; great numbers of them are sometimes dug up from these situations. They lay their eggs on straws, which they gather together and cover over; they are watched by the parent until they arrive at maturity; I have seen many of them in the trenches of the sugar estates; the adults are taken at this time by putting a basket near the nest, with which it is lifted out of the water. The spawn is very large, considering the size of the fish."

D. 1/8—2d D. with membrane—P. 1/6—A. 7—C. 12—Branch. 3—Vert. 23—Cirrh. 2/2.

The drawing of the second fish is marked, "Caught at *Curassarraka*, 17th Dec. 1837." Same name in L. Geral, *Tamoata;* Macusi, *Arawai.* Formula of fins, &c.

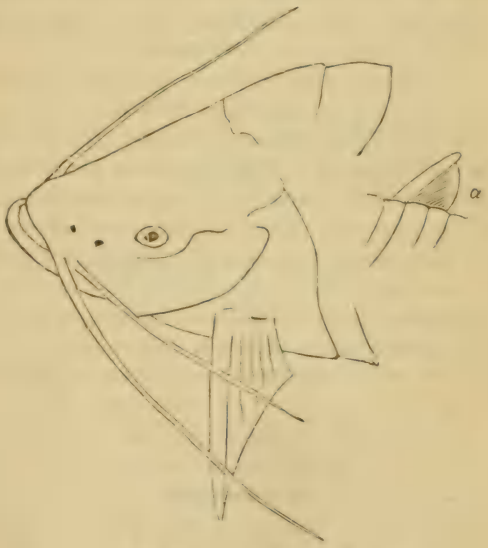
D. 1/8—2d D. 1, with a membrane—P. 1/6—V. 6—A. 7—C. 12—Branch. 3—Vert. 23.

From the drawings, it is difficult to discover whether the mailing of these fish have been smooth or rough; in this, the markings lead us to believe that it has been rough, particularly on the head; and the first ray of the pectoral fin seems to have been spined or serrated near the tip. The mouth of this species is terminal, but the upper jaw projects and

is furnished with four cirrhi, the under ones longest reach to about the middle of the pectoral fins; and both are barred alternately for their whole length, a marking which we have not seen noticed in any description. The plates appear to be twenty-four or twenty-five in number.

Both the older and modern writers agree in the facts, that fishes of this genus are capable of surviving for a long period out of water; that when that element fails them, they have even the instinct and power to travel overland in search of some other pool not yet dried up; and in the want of this, by burying themselves in the ground, they can sustain life in a state apparently torpid, until the return of the rainy season again fills the temporary reservoirs. Nests are also formed of straws and grass, where the ova are deposited; and which are watched over and defended by one or both of the parents, with a solicitude which we have not been accustomed to give this class of beings credit for. Whether these curious properties are common to the whole genus, or to what species they are more particularly the attributes, does not seem yet to be clearly defined; and we would consider these facts worthy still of investigation, together with a more minute examination of the branchial and respiratory structure. Ten species are indicated by Valenciennes, but few remarks are given relative to their habits or structure, all of which require investigation. One or two small species are figured in the Atlas of D'Orbigny, and of one, *C. levigatus*

(pl. v. fig. 2), it is remarked, that it was found in the province of Corrientes, in still waters, always at the bottom, in the sand or mud. They conceal themselves under and among the aquatic plants, swimming slowly, and feeding on the small worms and insects which may fall into the water. They are not used as food, and will not bite at a baited



Callichthys, No. 22, Schomb.

hook. This species had been kept out of the water for eight or ten hours without appearing to suffer.*

* Quoted from Valenc. xv. p. 315 and 316.

DORAS.*

Valenciennes divides his genus into two forms: those having the mouth cleft at the extremity and furnished with teeth on each jaw, and those having it placed below with teeth in groups on the lower jaw only. The characters given by Spix apply more particularly to the large species described as *Corydoras edentatus*, Spix, *Doras Humboldtii*, Agassiz, the *D. niger* of the present volume; we would consider that which we are about to describe as more typical, where the plates cover the whole body with the exception of the belly and the centre of the back. The "*corpus nudum*" must therefore be taken under modification, so also must the "*os parvum*," which is sometimes of considerable size and cleft terminally. The characters in Spix are:—

"Dentes velutini, minuti, in mandibula, ossibus inter-maxillaribus imoque in vomere. Membrana branchiostega radiis sex. *Os parvum.* (Os mediocre terminalis inferiusve). Cirrhi sex. Caput clypeatum. *Corpus nudum* (omit 'corpus nudum') in utroque (vero), corporis latere series scutorum osseorum, in medio spina aut carina elevata instructorum. Pinnæ dorsales duæ, posterior adiposa, interdum vix distincta. Radius primus pinnarum pectoralium, et pinnæ dorsalis validissimus, serratus."

In the first division, and typical of what we shall consider the true form of Doras, we possess specimens and drawings of three species. The first agrees closely with the minute description of *D. costatus* which is given by Valenciennes, and to this we

* Probably from δορας, a spear.

shall now refer it, mentioning any discrepancies as they occur, in their proper places.

Doras costatus, *Lacep.*; The Mailed Doras. —Le Doras a cotes osseuses, *Valenc.* xv. p. 268.— Saurauwari, Macusi Indians; Yarauira, L. Geral. *Schomb. Drawings*, No. 41.

This species seems distinguished from the others in the Collection by the much stronger armature of its spines and plates, and by the strong spear-shaped process which runs from the gill-aperture along the sides. The costal plates are in number thirty, each, except the three first, furnished with a strong hooked, lance-shaped spine; the plates are simply granulated on the surface. Mouth furnished with six cirrhi; two on the upper jaw longest, reaching to the first costal plate; four on the lower shorter, the first scarcely more in length than one-third of that which accompanies it. Our fish was a female, and in length is about ten and a half inches.

The formula of the fins given by (1.) Schomburgk; (2.) Gronovius, pl. v. figs. 1, 2; (3.) Hancock, Zool. Journ. iv. p. 242; (4.) Valenciennes; and (5.) as counted in specimen:—

(1.)	D. 1/6—P. 1/7—V. 6—A. 12—C. 11—Branch. 6.				
(2.)	7	9	7	12	17*
(3.)	1/6	1/5	7	9	20
(4.)	1/7	1/7	7	11	17
(5.)	1/7	1/6	7	12	1/11.

From these apparent discrepancies, supposing all the authors to have described the same fish, it is

* Preter nonnula minora utrinque liberalia.

probable that, as in other fishes, these rays may not, so far as number is concerned, be a certain specific character. In the dried specimen, and from the description of Valenciennes, the colours may be stated as of a dull brown, clearer along the centre of the costal plates, and upon the lower part of the head and strong rays of the fins. In the drawing before us, however, the whole fish is represented of a deep greenish blue, paler and tinted with yellow upon the lower part of the head and rays of the fins, and very much darker upon the whole of the plates covering the upper part of the head; the line running along the centre of the body and the spines are nearly white, and relieve the dull tint of the other parts. The eye is coloured chestnut-red. Dr. Hancock describes his *Doras costatus* to be brownish grey. Valenciennes considers Hancock's Doras as new, and gives it the appellation of *D. Hancockii*, * and from the descrepancy of the description in the Zoological Journal, and in the formula of the fins given above, we are inclined to agree in its distinction. The accompanying notes observe, " This species resembles the last (the species we next describe), but grows to a foot in length; the tail is rounded; adipose fin situate over the anal, to which the anus is near. The body is round; cranium covered with bony plates, serrated at the edges, and ending in the middle in a long spine; a white stripe runs along the middle, where these spines are situate. The air-bag is double,—

* Vol. xv. p. 279.

one-half oval, the other long and pointed. The nostrils are single, round, placed near the snout; eyes near the middle of the head, with a brown iris (in drawing coloured bright chestnut red); the tongue is fleshy; teeth thickly set in both jaws, fine; intestines long, forming several flexures; the gut large near the anus; roe long, large, and double; eggs large. Gill-opening semilunar, the lid smooth-edged, with a striated surface. This fish lives long when taken out of the water, and is taken by bait and with the hand, about the roots of trees, where it forms for itself a retreat."

Another small species, with a drawing, occurs in the Collection, which we refer to the "*Callichthys cirris sex*," &c. of Gronovius, tab. iii. figs. 4 and 5. Valenciennes quotes this as a synonim under his *D. cataphractus*, which he considers nearly allied if not identical with his species previously described, *D. armadillo*. The specimen is of a brownish colour, with the centre of the plates paler, but from the drawing may be described as,

Doras,—above deep olive-green, on the belly yellowish; lateral line of plates white; tail forked, with a double dark band,—the first basal, second nearly central; dorsal and pectoral spines deeply striated; lateral plates 29, each plate with smaller spines above and below the lateral line; cirrhi, 2 upper, 4 lower jaw. Uaricari of Warrau Indians; Dakerro, L. Geral. *Schomb. Drawings*, No. 40.

Formula of fins, (1.) Schomburgk; (2.) Grono-

vius, tab. iii. figs. 4, 5; (3.) Valenciennes, of *D. Cataphractus*:—

(1.) D. 1/5—P. 1/4—V. 7—A. 12—C. 22—Br. 6.						
(2.)	5		6	9	19	6.—Lat. pl. 29.
(3.)	1/4	1/4	1/5	9	17	26.

In the manner in which the numbers of Gronovius are expressed, we are not sure whether the strong rays of the dorsal and pectoral fins are counted or not; if intended to be counted, the numbers would agree. In the specimen we find 12 in the anal fin; and in the tail, by taking within the two exterior longest, we find 19 only, although others on the dorsal side, running shorter, make up Mr. Schomburgk's number. Different observers count in different ways, and confusion in numbers have often in this way taken place.

"This fish is a native of Rio Negro; is drawn of the natural size; the caudal fin is forked; ventral placed half distance between the pectoral and anal fins; adipose fin over the anal, small. The cranium is hard, opercles striated; the mouth terminal; teeth fine, thickly set in both jaws; cirrhi on the upper longer than those on the lower jaw; pectoral and dorsal spines serrated; along the sides a series of scaly plates, spined at the edge, and terminating at the angle in the middle with a large spine; a bony process on the body, near the head, which the dorsal spine lies against when it is closed. Colour of the fish is olive-green, darker on the back, with lateral line white; eyes yellow. Intestines form several

flexures, the gut large as it approaches the vent; the gill-opening semilunar, with smooth edges for the spiracles; the roe long and double; air-bag double,—the first division, near the head, flat and oval, the second long and pointed. They are eaten by the inhabitants; occasionally take bait, but are killed in great numbers by poisoning. In the dry seasons their haunts are under the roots of trees, in sand-banks, where they bore holes for themselves, and under rocks. This species does not much exceed the length of that which is represented in the drawing." (About five and a quarter inches in length).

Another species and drawing does not seem referrible to any description to which we have access; we place it provisionally under the name of

CHESTNUT-BELLIED DORAS.

Doras castaneo-ventris.

PLATE III.

Macusi, Karakiru; Warrau, Mutu-mutu; L. Geral, Kerukeru; in MSS., Anoya. *Schomb. Drawings*, No. 42.

The specimen is seven inches in length. In form the head is rather depressed; the eyes small, placed considerably forward, protected anteriorly by a process apparently of the superior maxillary bone, which seems capable of motion, and is spined upon its edges; nostrils small, and placed near the margin of the lip; the cirrhi reach to about the insertion of the pectoral fins. The buckler is strong and granulated, nearly regularly rounded over its whole surface, and having a small plain oval depression between the eyes. The number of entire costal plates is twenty-eight, preceded by two imperfect ones. These have the usual strong central spine, but the spination upon the whole surface of each is also strong, meeting on the back about mid way between the first and second dorsal fins, and continued thence to the tail, upon the rays of which, for half their length, it also prevails. The rays of the dorsal and pectoral fins, in addition to being ser-

rated on their edges, are also spined upon their upper surface, which is also the case with the strong axillary plate running along the sides; the lower surface of the strong pectoral rays is striated. The pectoral plate is produced at its posterior angles to two sharp points, which also is slightly armed; the whole lower surface, to the insertion of the anal fin, is otherwise smooth. The lower jaw projects slightly beyond the upper.

The formula of the fins from Schomburgk's MSS.:

D. 1/4—P. 1/5—V. 6—A. 11—Br. 6—Vert. 26.

In colour, the specimen, like the others, is of a uniform rather deep brown; the lateral spiny line of a yellowish white. The fins appear to have been clouded with a deeper tint, particularly conspicuous on the ventral and anal members; and the tail has two transverse pale bands,—the one at the base distinct, the second about the centre more clouded. In the Drawings, the colours of the whole upper parts and the anal fin are of a deep greenish blue, enlivened by the nearly white colour of the spiny lateral line. The smooth part of the belly, the ventral and soft part of the pectoral fins, are coloured bright chestnut brown, blotched with large markings of deep blackish brown, paler on the fins; the eye is red. Our notes observe, "This fish was found in the river Pasawiri, and is drawn nearly of the natural size. The cranium is hard: the body covered with bony plates, ending at the angle in spines, as in the two last; the tail is rounded; adi-

pose fin small, situate nearly over the anal; ventral and anal fins placed near each other; dorsal and pectoral spines much serrated; a bony process on the body, near the head, which the dorsal spine lies against when it is closed. The opercles have smooth edges, with striated surface; the cirrhi are long and white. It much resembles the two last in its habits and retreats, and is not much used for food." (The "two last" refer to Nos. 41 and 40, Schomb. Drawings, also our two last described specimens).

We have still the drawing of another small fish with the second dorsal fin, which will enter into this genus.

Doras brunnescens, Brown Dorsal-striped Doras.—Macusi, Kiru-kiru; L. Geral, Bayacu.—*Schomb. Drawings*, No. 18.—The drawing of this fish, though characteristic, is scarcely sufficiently detailed to work from; for this reason we have named it as distinct from the *D. armatulus*, Valenc., to which it approaches in colouring, but not at all in habits. From the drawing we cannot count the costal plates, and the formula of the fins unfortunately have been omitted. The formula of Valenciennes is given underneath, with his description, which can be compared with the notes of Mr. Schomburgk.

D. armatulus, Valenc.

"Cost. pl. 28 or 29—D. 1/6—P. 1/6—V. 7—A. 12—C. 17."

"Ce poisson est d'un brun noir; un band fauve-clair commence au-dessus de l'œil, transverse le coté

du casque et suit la série des épines jusqu'au milieu de la caudale, dont le bord superieur et l'inferieur sont aussi fauves; un ligne fauve moins tranchée suit la langeur du milieu du dos. La moitié inferieure de la dorsale est fauve clair ou blanchâtre, la moitié superieure est noire. L'anale a aussi une grande tache noirâtre; la partie molle de la pectorale est noire, excepté le tiers de la base, qui est blanchâtre. Tout le dessous est d'un gris brun, plus pale en avant." Found in the Parana, but not below 27 deg. 30 min. south latitude; never exceeding four inches in length. Frequents stony parts of the streams, where there is a considerable current, and never bites at the hook. *

" This fish is found in the Upper Essequibo, and seldom exceeds five inches in length; the snout is flat, back high, body short and thick, tail rounded, dorsal and pectoral fins have serrated spiny rays, a spiny process on the body which the pectoral spine lies against when the fin is closed; upper part of the body covered with spinous armour, belly without armour. Colour dark brown, with a line of ochre along the back, and one along the lateral line; belly lighter, spotted with ochre; all the fins are light brown, banded and spotted with black; the eyes are small and dull; cirrhi, two in the upper and four in the lower jaw; opercles smooth; gill-opening semilunar. When killed, a milky substance is found in the head, very bitter to the taste; and there is a species in the creeks of the Demerara

* Valenc. Hist. Nat. des Poissons, xv. p. 274.

river, entirely black, which possesses a similar substance. They bite the bait readily, and are an annoyance to fishers, in nibbling off the bait from the hooks which are set for better fish: they are sometimes, but seldom, eaten."

Doras? niger, *Valenc.*; Black Doras.—Macusi, Saurawari; inhabitants of Esmeralda, Cuiucuiu. *Schomb. Drawings*, (2).—It is noted on the drawing of this fish, that there is no adipose dorsal fin; but this may have been overlooked from the peculiar structure, or very small development or plicate form sometimes assumed by this part; in the uncertainty, we introduce it last.

At the period of the publication of Spix's Fishes of Brazil, M. Agassiz considered the large Doras figured on plate v. as *Corydoras edentatus*, Spix, *Doras Humboldtii*, Agas., to be distinct from the fish described in the Zool. Researches of Humboldt, by M. Valenciennes, under the name of *D. niger*. M. Agassiz pointed out what he considered the distinctions: but as the drawing agrees best with the late description of *Doras niger* in the Histoire Naturelle des Poissons, we have given it now under that name, without pretending to settle the question whether one or two species are involved in those referred to above. In our drawing the fish is coloured entirely black, with a blueish lustre on the fins and tail, and having the belly clouded with dull purple and altogether paler; and the whole showing a metallic or bronze lustre. The eye blue. The cirrhi, six in number, are not so long by one-

half as in the figure of Spix; and the tail appears to have been nearly square.

The formula of the fins, in Spix and Valenciennes, agree nearly; in our notes, we regret they have been omitted. (1.) *Doras niger*, Valenc.; (2.) *D. Humboldtii*, Agas.

(1.) B. 8.—D. 1/6—P. 1/10—A. 11—V. 7—C. 17—Cost. pl. 24.
(2) 16/6

" D. Niger, *Valenc.*—(Ore edentulo). Corpore nudo lævi, scutellis trigonis in utroque latere 24. Caput magnum elongatum, antice acutum, clypeatum. Labia crassa, cirrosa. Cirri sex, duo ad rictum; quator æquales brevissimi, in maxilla inferiore. Scutella lateralia, quorum priora quatuor, inermia, cætera triangularia, aculeata. Pinna adiposa porrecta, angustata." †

Regarding another doubtful species, Mr. Schomburgk says:—" The following account of a species of Doras, or one of the Callychthidæ, has been politely furnished to me by Dr. Hancock, who, himself a long resident in Guiana, made several excursions into the interior, and accompanied, in 1810 and 1811, an expedition which the colonial government of British Guiana dispatched at that period into the interior with a view to inquire into the feuds of the natives.

" *Mailed Fish caught at the Orooporary* ‡, *Dec.* 26, 1811.—Amongst these falls, in a very shallow rapid, one of our Carib guides caught a singular fish,

† Humboldt, Zool. Researches, ii. p. 184.

‡ A cataract on the river Essequibo, in about 4 deg. 38 min. north latitude.

armed with a coat of mail,—a species of Doras, or one of the Callychthidæ. It was adorned with beautiful bright yellow and scarlet colours, and elegantly spotted with black. Such a display of colours is rarely found in the mailed fishes; they are usually of a brown or dingy grey colour.

"This fish is not only furnished with the usual appendages for swimming, but by means of the strong supports which form the anterior spines of its pectoral and abdominal fins, it is enabled to walk upon the stony bottoms of the rivers, nay even, I believe, to pass the falls by walking along the shore; for it appears, like the *Hassar*, to be in some measure amphibious. Although it had received a severe blow on the head from the man who caught it, yet it lived, exposed to the sun's rays, for many hours afterwards. It made several attempts to jump out of the boat, but ineffectually. The Caribs called it *Acáaru*, the spinose fish, others the four-legged fish. The Arowaks were not acquainted with it, but said it resembled the Wata-wata in form. It was about ten inches in length; its head depressed, upper jaw shorter and moveable. It had no teeth, but short crooked spines in the lips. The pectoral and abdominal fins had each six rays, besides the strong ambulatory one, or rather spine, in each. Anal fin six rays, dorsal nine, with a sharp and strong anterior spine. It was armed, in addition, on each side, with four longitudinal rows of strong spines, curved backwards. The whole body, except the thorax, was guarded with a coat

of mail, consisting of strong plates, connected by cartilage, and moveable, like so many joints."

Among the few specimens of this form which have been dissected, the stomach has been seen to be large and round; in the *D. costatus* of Valenc. giving off at its base, on the right side, a branch which is prolonged to a duodenum nearly equal in size, which performs many folds beyond the stomach. The spleen is flat and large; the liver displays only a small lobe, and the gall-bladder is oval, with the kidneys large; the swimming-bladder large; the fibrous coat thick, and within, as if it were laid in folds. There is room for much research regarding their whole structure, and particularly for the correct study of their habits and manner of spawning, the structure of their respiratory organs, and the nature of the liquid which our author notices having observed in the cavity of the skull of only two species.

These will conclude the descriptions of the species of the Collection which will enter among the *Loricarinæ;* of the other forms of the Siluridæ, no specimens accompany the drawings, and there is thus a difficulty of judging of the value of some of the families which have been lately proposed. We shall, however, continue the genera as naturally as possible, and shall first take some of the more strongly armed or mailed. The genus

PHRACTOCEPHALUS, Agas.

is of a depressed form, a head large and disproportioned to the size of the body, strongly mailed, and

having the mouth with lengthened barbules; the first rays of the pectoral and dorsal fins are strong and spined. The generic characters are thus given, and our woodcut copy from the drawing will illustrate the form:

"PHRACTOCEPHALUS, *Agassiz.*—Dentes velutini per fasciam latam in ossibus inter-maxillaribus, in vomere, in mandibula, et in quinto radio branchiali. Membrana branchiostega radiis 8. Os maximum. Cirrhi 6. Caput latissum, scuto maximo ad nucham usque producto tectum. Corpus nudum. Pinnæ dorsales duæ, posterior adiposa; radius primus pinnarum pectoralium validissimus, serratus."

P. HEMILOPTERUS, *Agas.*—Pirarara bicolor, *Spix*, tab. vi.—Phractocephalus bicolor, *Agas.* in *Spix.*—Le Phractocéphale hémiliotere, *Valenc.* xv. p. 3.—Paruaruima, *Schomb. Drawings*, (1).—There appears yet to be only one species of this genus discovered, and our drawing agrees generally with the figure given in Spix; in it, the first spine of the pectoral fin is represented as serrated on both sides; in Schomburgk's figure, it is serrated only towards the point of the inner side. In the first, the lateral

line is represented as serrated, which we do not perceive. The cirrhi on the upper jaw of Spix's fish exceed the pectorals in length; in the other they are shorter by three-quarters of an inch in the reduced drawing; but without the examination of specimens, we could not be sure that these discrepancies were sufficient for specific distinction. In colouring, our drawing shows deeper tints; the upper half of the body is olive-brown, shaded into a dark line at the junction of the colour with the pale straw-yellow of the lower parts, which shades into brick-red on approaching the dark lines; the dorsal and adipose fins, with the tail, are brick red, shading into olive at their bases; the eyes are represented blue. The following formula of the fin rays may be compared together:—

Schomburgk.	D. 1/7—	P. 1/8—	V. 6—	A. 10—	C. 24—	Br. 8.
Agassiz.	8	10	7	8*	17†	
Valenciennes.	1/7	1/9	6	8	17‡	9.

Mr. Schomburgk remarks:—"A fish attaining from three to four feet in length, and common to all the rivers of Guiana. The head broad and depressed; the helmet, which is formed by the cranium, is rough or shagrined, and a distinct osseous plate intervenes between it and the spine of the first dorsal fin. The lateral line is curved, commencing near the intervening buckler, and terminating towards the middle of the tail. The nose-holes or nostrils are double,—the first pair near the snout, the second mid-way between the snout and the eyes; the eyes

* Two small. † 6, 3 minores. ‡ Et quelques petits.

oval, greenish blue; tongue round and fleshy; upper jaw slightly produced, and in each a band of crowded teeth; gill-openings semilunar. The air-bladder is single and heart-shaped; milt double, short, and thick. They are very voracious and take bait readily; and when hauled on shore, after being caught with the hook, they make a loud grunting noise. They bite best by night, and are excellent eating."

Agassiz has dissected this fish, and states, that the opening of the mouth is immediately expanded into a large sac, forming the stomach, of the form of a globe, compressed anteriorly and posteriorly, and which fills nearly the whole upper part of the abdominal cavity. The walls are thickened; above, on the left side, the cæcal appendage arises, and, what is remarkable, the small intestine takes its origin behind nearly the same part. The air-bladder is very large, heart-shaped, and compressed, situate behind the stomach and outside of the peritoneum, —it stretches to the lower third of the abdominal cavity; the walls are thick, fibrous, and silvery.— Agassiz has remarked a small mucous opening between the scapular processes and pectoral fins, which has not been noticed by Valenciennes, nor is it mentioned by Schomburgk. Future observers should attend to this.

ARIUS.

In the genus to which we have referred the next two fishes, we are uncertain, looking at the distinc-

tions which have been laid down by Valenciennes between *Bagrus*, *Arius*, and *Pimelodus*, among which they ought most properly to range. These have been taken from the teeth, their position and form, which it is difficult to ascertain from notes and drawing only. In all, the form is remarkably similar; so much so, that many of the Siluri of Hamilton Buchanan run into the others, and have been separated. This is, indeed, so much the case, that we are not sure if the dental classification be not too minute and artificial. In *Bagrus*, the palatine teeth are disposed in single transverse bands; in *Arius*, as characterised by Valenciennes, and which is made to contain species from Africa, Asia, and South America, the palatine teeth form two distinct and separated patches, and are generally inserted in the palatine bones, although they sometimes advance upon the angles of the vomer. In *Pimelodus*, again, the palate is smooth, and entirely without teeth. † Unfortunately, Valenciennes does not give his characters so that they can be transcribed. *Pimelodus*, as characterised by Spix and Agassiz, would contain all those of which we have drawings or any notes, but we have chosen to place two of them, provisionally, along with *Arius*, on account of their approaching nearer in form to some of those figured in the various works to which the French ichthyologist is at present contributing, particularly in the strong armature of their fins. &c. The first we shall for the present entitle

† Valenciennes, Hist. Nat. des Poissons, xv. p. 21.

MARBLED ARIUS.

Arius oncina.

PLATE IV.

Warrau, Awàyu. *Schomb. Drawings*, No. 49.

"This fish was taken in the Rio Padauiri. The dorsal and pectoral spines are serrated, cranium hard, body without scales, but there is a bony process on which the dorsal spines close, posterior to the helmet or cranium. Lateral line straight, body yellowish brown, variously spotted with black, and not unlike the markings of the jaguar. The ventral fin is placed nearer to the anal than the pectoral, the second dorsal moderately large; tail is slightly forked, and has the upper lobe rather longer than the lower. The eyes are small, placed near the snout, iris brown; nostrils near the snout; teeth, a series thickly set in both jaws, all fine. Surface of the gill-covers slightly striated, edges smooth, opening semilunar; lives often three or four hours after being taken from the water. It is taken by the hook baited with worms on set-lines at night, and is one of our best flavoured fish; it is considered a great luxury, and grows to the length of ten inches. Intestines form flexures, and have appendices attached.

Another fish, of which we have even still greater doubt of ranging in the present genus of Valenciennes, we here provisionally name, from its form,

ARIUS? OBESUS, *Schomb. Drawings*, No. 57.—Our scanty notes mention the specimen to have been, "nine inches in length, in girth seven inches and three-quarters at the thickest parts. It is very fat, and is found under trees which have fallen into the river. The teeth are a series thickly set in each jaw; the intestines have no appendices; no food was found in the stomach. Rio Branco, April."

The drawing is coloured of a dull bluish black, paler or slightly silvery beneath. The buckler is large, and is represented as granulated, projecting in a sharp angle on each side above the gill-openings. The first spines of the dorsal and pectoral fins, both in this fish and in the preceding, resemble those of the truly mailed fishes, and seem capable of being applied for similar purposes; here they are strong and toothed on both edges, and from the back of the pectoral spine or beneath the gill-openings arises another, pointing backwards, equally rugged in appearance. The anal fin is more than usually elongated. The cirrhi are six, but of only moderate length, those on the lower jaw short. In form it is allied to *Aspredo*, but varies in the presence of the second or adipose dorsal fin.

PIMELODUS.

The next series of interesting fishes to be noticed we shall place provisionally in *Pimelodus*. In that genus, as characterised by Valenciennes, none of them could rank, being all provided with teeth in one form or another; but in the uncertainty of their true structure and position, it would be equally uncertain whether they should range with *Arius* or *Bagrus*. They all possess a greater development of the second dorsal fin than we have yet seen, and most of them are somewhat strongly armed anterior to the first dorsal fin. The characters adopted by Agassiz will take them all in.

> "PIMELODUS, *Lacep.*, *Cuv.*, *Agas.*—Dentes velutini. per fasciam in ossibus inter-maxillaribus et in mandibula dispositi. Membrana branchiostega radius 5—10. Os magnum. Cirrhi sex. Caput nudum aut scuto majori minorive obductum. Corpus nudum. Pinnæ dorsales duæ, posterior adiposa. Radius primus pinnarum pectoralium et pinnæ dorsalis validus serratusque."

Of the first fish, which we shall place here, we possess only an imperfect drawing, from the caudal fin of the only specimen obtained being mutilated; but from the general form and the distribution of the teeth, as indicated by our notes, it would range in *Bagrus* of Valenciennes. It may presently stand as

PIMELODUS (*Bagrus*) MACULATUS. — WARRAU, Mohocco; L. GERAL, Jandia. *Schomb. Drawings*, No. 43. — "This fish is found in most of the

rivers of Guiana, also in the Rio Negro and Amazon; it grows to twelve inches in length, with

cranium hard, head depressed, dorsal and pectoral spines serrated, a bony process for the pectoral spine to lie against when closed; opercles striated, with smooth edges; cirrhi long; lower jaw a little longer than the upper; teeth, a series thickly set in both jaws; adipose fin very large; vent about the middle of the body. The eyes are oval, dull blue, and situate near the middle of the head; nostrils double,—one pair on the snout, the other on the top of the head half-way to the eyes; the lateral line is nearly straight, running along the middle of the body; ventral fins half-distance between the pectoral and anal. They are said to be much used for food, and are well tasted. The body is without scales, its colour bluish green, with lighter spots, and becomes nearly white on the belly and under part of the head."

D. 1/6—P. 1/9—V. 6.—A. 12—Br. 8."

No. 5 of Schomburgk's Drawings represents another species, which also would probably rank with

the *Bagri;* it is thus described in his notes:—"This fish is found in the rivers of Demerara and Essequibo, as well as those of Brazil. The body is long, without scales, of a bluish black colour; the belly whitish, finely spotted with black; the head compressed; jaws equal; teeth, a fine series, thickly set in both jaws; cirrhi on the upper jaw long; eyes placed near the middle of the head, oval, bluish; nostrils double,—one pair on snout, the other nearer the eye; the tongue round and fleshy; opercles smooth; ventral fins at equal distances from the pectoral and anal fins; a small bony process which the pectoral spine lies against when closed; adipose fin very large, lateral nearly straight. Air-bag single, heart-shaped; the intestines form several flexures; milt double, thick, but not very long. This fish will live for an hour after being taken from the water; it takes the hook at night, baited with worms, and is an excellent fish; it reaches the length of eighteen or twenty inches." The native names are—ARAWAAK, Laukidi; L. GERAL, Jandia.

D. 7—P. 1/7—V. 6—A. 9—C. 18—Br. 8—Cirrhi 2/4—Ribs 11 pairs—Vert. 45.

Our next three figures will show species remarkable for their spotted markings, and at the same time presenting a considerable degree of beauty and symmetry.

TIGER PIMELODUS

Pimelodus arekaima.

PLATE V.

Carib, Yacima; Arawaak, Aruà; Macusi, Arekaima; L. Geral, Jantia; Creole, Tiger-fish. *Schomb. Drawings*, No. 9.

"The fish from which the drawing has been made was caught in the Upper Essequibo, 14th October 1837; they are pretty plentiful, and are also found in the Rio Branco. It is without exception one of the best fish for the table to be found in any of the rivers of Guiana; the flesh is firm, fat, and of an excellent flavour, with little bone. The cranium is hard and compressed; the opercles smooth, principal front bone rough, gill-opening semilunar, cirrhi two, very long on the upper jaw, reaching beyond the ventral fins,—four shorter; nostrils double,—one pair behind, the other near the snout; eyes oval, dull red. The body at the dorsal fin nearly triangular, round towards the tail. The fish entirely of a reddish brown colour, spotted irregularly with different sized spots of black, from which it has received the name of "*Tiger-fish.*" The belly is lighter, with the spots smaller and less

distinct. It is destitute of scales; has a spinous process on the body, near the opercle, which the serrated spiny ray of the pectoral fin strikes against. Lateral line straight, from the opercle to the middle of the tail; the ventral fin about the middle of the fish. Tongue fleshy, upper jaw produced, teeth fine and thickly set in both jaws; intestines making several flexures; vent situate near the ventral fin. Air-bag single, heart-shaped. This fish lives half an hour after being taken from the water; it is caught by the hook, baited with a piece of flesh or other fish, and is sometimes also shot with the arrow. They are not found below the falls, and therefore few except Indians enjoy this delicious fish. The length of the specimen was two feet three inches."

D. 11—P. 1/10—V. 6—A. 6—C. 24—Br. 9—Ribs, 14 pairs —Vert. 44.

BLACK-SPOTTED GREEN PIMELODUS.

Pimelodus insignis.

PLATE VI.

Wapisiana Indians, Konnairu. *Schomb. Drawings*, No. 33.

This fish is more symmetrical in form than any of the Pimelodi or their allies which occur in the Collection. The head is comparatively small, the body becomes fine or slender near the tail, and that member is largely developed and forked, as in a fish which possesses the power of swimming and moving with ease and rapidity. The second dorsal fin occupies nearly the whole space between the first dorsal and the tail, and the upper pair of cirrhi exceed in length any of those we have yet described, reaching to the termination of the anal fin. The accompanying notes regard it as a "Rio Branco species, pretty abundant, of a shining green colour, on the back with a brush of purple and white, and on the belly tinted with rose-colour. The head rather small in proportion to the size of the fish, the eyes placed near the middle; the gill-lids smooth-edged; the surface of all the bones smooth, except the opercle, which is slightly striated. The cirrhi on the upper jaw very long, nostrils double,

one pair on the snout, the other a little behind; upper jaw projecting, teeth thickly set in both, all fine. Lateral line running nearly straight along the middle of the body. Adipose fin very long, caudal fin forked and large. The tongue is round and fleshy; intestines form about four flexures. This fish lives about half an hour after being taken from the water, and is caught with the hook and line; it feeds on small fishes, and grows to about the length of eighteen inches."

D. 7—P. 11—V. 10—A. 6—C. 30—Br. 5—Vert. 46.

STRIPE-TAILED PIMELODUS.

Pimelodus notatus.

PLATE VII.

L. Geral, Caruatu. *Schomb. Drawings*, No. 31.

This is a very powerful fish, and, like the last, possesses no strong armature on the head or anterior to the dorsal fin; the body also becomes slender towards the tail, and that member is much developed; the second dorsal fin varies much in its small comparative size, while the cirrhi, not reaching beyond the ventral fins, are represented much

stronger, and in resemblance more like those of the *P. pirinampu* of Spix. Mr. Schomburgk states:—"This fish was taken at Fort St. Joaquim on the Rio Branco, where it is not uncommon; they are also plentiful in the Amazon, but scarce in the Rio Negro, and seem partial to muddy waters. The specimen was three feet in length, six inches deep at the dorsal fin, where the body is nearly triangular, but from thence it becomes rounded to the tail. The head is depressed, upper jaw a little longer than the lower, teeth very fine and thickly set in both; nostrils double,—first pair near the eyes, second near the snout. Eyes dull, of a bluish cast, oval, and rather near the snout; surface and edges of the opercles smooth; the cirrhi smooth and winged. Lateral line visible only from underneath the dorsal fin, running on the body to the tail; first ray of the dorsal fin long and elastic, spinous ray of the pectoral fin serrrated, the adipose fin large (not lengthened) and triangular. The general colour is a leaden grey, with black spots thickly set on the upper half of the body; the cheeks and sides are bluish, varying on the belly to cream colour, which is also the colour of the pectoral and ventral fins; the tail is large, with a black stripe on the lower lobe. The tongue is round and fleshy; intestines form three flexures, but are straight towards the vent; milt long and double; air-bag double, pointed, and bilobed. This is an excellent fish, being fat, well-tasted, and with little bone; it lives an hour after being taken from the water, and

is caught with the hook and line, baited with flesh or smaller fish."

D. 7—P. 1/9—V. 6—A. 17—C. 40—Br. 9—Ribs, 16 pairs—Vert. 44.

PIMELODUS PIRINAMPU, *Spix*. — P. pirinampu, *Spix*, tab. viii. p. 20.—ARAWAAK, Maripack; L. GERAL, Mantopac. *Schomb. Drawings*, No. 6.—There are a few discrepancies between the author above quoted and our drawing and description; the number of fin-rays vary, as may be seen by comparing the formula at the end of the description; and the spine of the pectoral fin is represented as serrated in Spix's figure, in ours it is smooth.—"This fish is found in the rivers of Brazil, as well as those of Guiana. The cranium hard, compressed; opercles striated, all the other gill-covering smooth; the eyes oval, blue, and dull; nostrils near the snout; back high; body nearly triangular at the dorsal fin, rounding from thence to the tail, which is forked; dorsal fin large, adipose very long (arising nearly at termination of first dorsal); pectoral, ventral, anal, and caudal fins webbed with blue, the latter spotted with vermilion (in the drawing, vermilion is the prevailing colour on all the lower fins). Body bluish green, lighter on the belly, and displaying there a rose-colour; the head is greenish brown; the cirrhi are black, webbed with blue, very large; lips are coloured lake; jaws equal, teeth thickly set in both. The tongue flat and fleshy; the air-bag simple, heart-shaped. This fish

lives an hour after being taken out of the water, and like all others of the genus, they take bait readily, and are an excellent viand, being fat and well-flavoured. They grow to two feet and upwards in length, and may weigh fifteen or twenty pounds."

Schomb.	D. 7—	P. 15—	V. 7—	A. 9—	C. 26.—	Br. 4— Vert. 48
Spix.	7	16	6	10*	17.†	

PLATYSTOMA.

"PLATYSTOMA, *Agas.*— Dentes phractocephali in fasciis latissimis. Membrana branchiostega radiis 15. Os amplissimum. Cirrhi sex. Caput depressissimum, planum, valde elongatum, maxilla superiore prominente. Corpus plus minusve compressum, omnino nudum. Pinnæ dorsales duæ, posterior adiposa. Radius primus pinnarum pectoralium et pinnæ dorsalis cæteris parum validor."‡

This genus contains many species, some of them reaching to a very large size, and many of them remarkable for their distinct and conspicuous markings. With the exception of what is contained in the notes of our own author, we have no knowledge of the anatomy or habits of these fish, and details of both should be marked as desiderata by future travellers.

* 2 minores. † 8, 10 minores laterales.

‡ Conspectus generum, Spix, p. 10.

ERRATUM.

By mistake, there should not have been a *Plate* XXIV. referred to in the TEXT and CONTENTS, there having been given two Plates XXV. instead.

STRIPED PLATYSTOMA.

Platystoma tigrinum, Valenc.

PLATE VIII.

Le Platystome tigre, *Valenc. Hist. Nat. des Poiss.* xv. p. 40.—Macusi, Corutto; Arawaak, Colite; Carib, Oronni; L. Geral, Surubim. *Schomb. Drawings*, No. 12.

On comparing the drawing before us with the descriptions in the Hist. Nat. des Poissons of *P. tigrinum* and *D'Orbigianum*, together with the plate of the latter given in the Atlas to D'Orbigny's work, we agree with Valenciennes in considering them varieties of each other. The spotting of D'Orbigny's figure and the description of *P. tigrinum* is just filled up by our plate, on which there is also seen a greater proportion of the white accompanying and relieving the black stripes; the spotting extends also to the lower fins. Our notes observe,

"This delicious and beautiful fish abounds in most of the rivers of Guiana; its flesh, like that of the tiger-fi (Plate V.), is yellowish, but well-flavoured. The body is elongated, cranium hard, snout long and flat, and deeply serrated. The eyes

are oval, situate near the middle of the head; nostrils single, on the snout; gill-lid smooth. Lateral line runs nearly straight to the middle of the tail; it has a bony process which the serrated ray of the pectoral fin shuts against. Tongue round and fleshy; the upper jaw slightly produced, the teeth fine and thickly set in both. Vent equidistant from anal and ventral fins. The colour of the body light blue, streaked with black and white; the fins blue, spotted with black; belly white. They are taken by the hook and shot with arrows, and are much esteemed by the Indians."

D. 7—P. 1/9—V. 6—A. 12—C. 30—Br. 14—Vert. 44.

Another species, nearly allied, and procured by D'Orbigny in the vicinity of Buenos Ayres, is *Pl. pardalis*, Valenc. The most important difference is mentioned to consist in the dorsal plate being not granulated. The colours of the fish are represented as nearly the same; the whole body and members, except the pectoral and ventral fins, being spotted over with small irregular black markings: upon the dorsal aspect, however, there are the pale irregular bands reaching to the centre of the fish. This species attains a large size, reaching a length of five feet.

Before leaving this form, we should notice the structure mentioned by Schneider to have been observed in the *P.* (*silurus*) *fasciatus* of Surinam. There is a hole on each side, above the pectoral fin, by which the abdomen can be inflated;

this is not noticed by Valenciennes in any of the species above mentioned, nor by Mr. Schomburgk; but it may have been overlooked by the latter, if not aware of the circumstance, as it appears at first to have been by Schneider himself. The presence of a spine under the gill-covers, and above the pectoral fins, seems also to remove the want stated by Swainson, "that the *Pimelodinæ* of Tropical America want the spine attached to the gill-covers." * This, though not attached, may present the analogy.

THE FLAT-HEADED PLATYSTOMA; PLATYSTOMA PLANICEPS, *Agas.* in *Spix*, pl. xii.—Le Platystome à tête plate, *Valenc.* xv. p. 19.—L. GERAL, Piranya-pu. *Schomb. Drawings*, No. 32.—Is not found within the boundary of British Guiana, but as one in the Collection of Drawings, is now introduced; it so closely resembles the figure and description of Agassiz, that we consider them identical. We should also remark, that the Indian name accompanying both specimens is the same; Agassiz reports it as found in the rivers Amazon and Negro. The colour is more of a bluish olive than that represented by Spix; the lips and lower fins are tinted with pink, and the spots on the dorsai and pectoral fins are more conspicuous. Our formula of the fins agrees with that of Agassiz in all important parts, but Valenciennes has given 16 rays for the dorsal, which we can only interpret as a misprint. Our notes state,—"This fish is a native

* Fishes, vol. i. p. 341.

of the Rio Branco; the body, without scales, is of a lead colour, spotted and striped with black; the belly is white, with a long black bar. The body is much elongated, the cranium hard and bony, gill-lid smooth-edged, the opercle striated; snout flat; upper jaw produced an inch, the cirrhi there very long. Eyes flat, oval, dull blue; nostrils double, situate behind each other near the snout; lateral line bent from the top of the opercle, reaching the middle of the body under the dorsal fin, and proceeding straight to the middle of the tail. The teeth, a series thickly set in both jaws, of a fine needle-shaped form. The intestines form one flexure; the air-bag is single, flat, and heart-shaped. This species also takes the hook readily, and small fish are found in the stomach."

D. 7—P. 1/10—V. 6—A. 12—C. 18—Vert. 45.

Among the Platystoma described by Valenciennes there is one placed among his section having 15, 16, or 17 rays to the gill-covers, which was received from Guiana,—the *P. Vaillantii*, Valenc. It is remarkable for the excessive length of its cirrhi, of which the maxillary ones, in young specimens, exceed the end of the caudal fin, although it even has the points of its lobes prolonged into long filaments. In one specimen the filament of the superior lobe is double that of the rest of the fin. When fresh, the colours are said to be lead colour and silvery, while in spirits they appear of a dull fawn colour. They have been observed from from six inches to two feet

three inches in length. In the internal structure, the only part noticed is the air-bladder, which is large and is divided into two parts.

B. 11—D. 1/6—A. 3/10—C. 17—P. 1/10—V. 6—Vert. 42.

HYPOTHALMUS, Spix.

We have a single drawing of a fish referrible to the genus Hypothalmus as characterized by Spix, though it varies in many points from the restricted characters laid down by Valenciennes, and in both form, position of the fins, and internal structure, would come in almost intermediately between the genera *Hypothalmus* and *Auchenipterus* of the latter author. In the structure of the branchial arches, these fishes are remarkable in having interior processes elongated and toothed or serrated, as in *Coregonus;* and Agassiz has remarked that they may be employed in capturing "*innumera animalcula tenella*"* for their support. The notes of Mr. Schomburgk do not allude to this structure in our present fish, which may either have been overlooked, or, what is more probable, does not exist to the same extent, as we learn that it took bait freely. The internal structure, according to Agassiz, is nearly as follows:—The intestines very small, with many flexures; œsophagus short; stomach oblong, rounded above; the abdominal cavity very small, scarcely equalling the head in length. Valenciennes restricts

* Spix, p. 16.

the form to those destitute of teeth, and with the dorsal fin removed from the nape, or placed nearly above the ventral fins, and describes only three species, one of which is the *H. edentatus*, Spix, given under the new title of *H. Spixii*. He remarks the peculiarity of the branchial arches, and the numerous folds and length of intestines confined in a cavity of very limited extent. "The digestive tube commences by a long and narrow œsophagus, which is suddenly enlarged to become the stomach, which is short, without forming any pouch; a contraction marks the pylorus, and immediately commences the duodenum, folded twice upon itself, becomes very narrow, and forms a slender tube, which winds so often that it is impossible to describe the folds. This intestinal mass is embraced by the two triangular lobes of the liver, and is concealed by its fatty epiploons. The gall-bladder is small, and there is no swimming-bladder." *

The characters given by Spix, to Hypothalmus, are as follow:—

"Dentes minutissimi, vix conspicui, velutini. Membrana branchiostega radiis 5 vel 15. Arcus branchiales elasmiis instructi. Os angustum. Cirrhi sex. Caput parvum, ut corpus, compressum, in rostro depressum et omnino nudum. Oculi in margine inferiori et laterali capitis siti. Pinnæ dorsales duæ, posterior adiposa. Pinna analis ab ano ad pinnam caudalem producta. Radius primus pinnarum pectoralium et pinnæ dorsalis cæteris paulo validior, serratus."

* Hist. Nat. des Poissons, xv. p. 229.

DAWALLA OF THE ARAWAAKS.

Hypothalmus dawalla.

PLATE IX.

Arawaak, Dawalla; L. Geral, Mapara. *Schomb. Drawings*, No. 11.

This fish was taken at the junction of the Rupununi and Essequibo, 15th October 1837; it was a male, and differs from all those described, by either Spix or Valenciennes in *Auchenipterus*, by its brilliant colours and the shortness of its cirrhi.

"This fish is found in the rivers of Guiana, and is justly esteemed for the delicacy of its flesh. The head is much compressed, body rather triangular at the dorsal fin, but oval as it nears the tail; dorsal fin over the pectoral, the ventral about the middle of the body. The head and back are green, varying to blue and carmine; the lower part, from the ventral fin to the tail, is carmine, as also the gill-rays. Dorsal, pectoral, and anal fins brown; adipose, green tipped with carmine; anal and caudal, carmine tipped with black. The body is destitute of scales; lateral line nearly straight. It has a pair of short cirrhi, which are hidden in a groove near the eye; nostrils double, placed near the snout;

eyes oval, situate in the middle of the head; the iris yellow. Tongue round and fleshy; jaws nearly equal; teeth, a series thickly set in each jaw, with two like processes on the palate. Intestines form only one flexure, and the vent is situate equidistant from the ventral and anal fins; milt long and double. The dawalla lives an hour after being taken out of the water, and reaches a length sometimes of two feet and a half. In the creeks, near the thickly populated districts, they are very hard to take, and will only bite at live bait; but in ascending the Essequibo, where it has fewer inhabitants, we found no difficulty in taking them with hooks baited in the usual way; we also obtained a good number at Fort St. Joaquim, in the Rio Branco."

D. 7—V. 7—A. 38—C. 35—Br. 11—Ribs, 11 pairs—Vert. 52.

There will thus, from the foregoing description, be seen to be a considerable discrepancy in the structure as given in Mr. Schomburgk's notes and the observations of Agassiz and Valenciennes; and we would desire that particular attention should be given to the general anatomy and to that of the branchial arches. We have no details either of the habits of these fishes, or of the place and manner of their spawning.

The only other drawing in the Collection, belonging to the Siluridæ, which we can notice, is an imperfect sketch of the large fish, *Lau-lau*, alluded to in the Introduction (p. 99). It is so imperfectly finished, that it is not possible to make out the spe-

cies satisfactorily, but from the extended economical uses to which it might be applied, every information regarding it is of importance. An outline of the drawing is added, with Mr. Schomburgk's notes.

"The lau-lau is, next to the pirarucu (*Sudis gigas*), the largest fresh-water fish of the rivers of Guiana. Although it has been sometimes secured near the mouth of rivers which fall into the sea, it is nevertheless my belief that it has been carried thither by accident, and belongs properly to the inland rivers. They sometimes attain the length of ten or twelve feet and the weight of two hundred pounds, and their flesh is so much esteemed, that it is considered to be one of the ties which binds him who has once tasted it, for ever to the region where it is indigenous. It is smooth, of a greenish black, and silvery white near the belly; mouth and fins yellow, behind the latter somewhat reddish. The head is flat and broad, and covered with a strong

bony plate which expands to the first dorsal fin. The first ray of the first dorsal and of the pectoral fin is strong and spiny, studded with whitish bony tubercles, and can be depressed or erected at pleasure. Four barbules below, those nearest the mouth smaller, two above; nostrils double, about an inch apart. Eyes small; iris silvery. Intestines with numerous appendices or cæci, otherwise simple. It is remarkable that the young of the lau-lau are excluded from the ovarium into the abdomen, in which state they might be likened to the yolk of an egg, in which the two specks of the eyes, the mouth, and fins, are, however, observable. If a lau-lau should be taken when near parturition, in consequence of fear, the eggs pass off. Mr. Hillhouse has assured me that he had repeatedly put the eggs in a glass of water, where they hatched themselves, and the young fish appeared with a large yellow protuberance on its belly, like the abdomen of a chicken just hatched. When left to nature, the eggs are hatched in the abdomen; and when the young are excluded, they swim in large shoals over the head of the mother. In case of danger, the mother opens her mouth, and the fry find a safe retreat in the thorax.

"They live chiefly upon other fish, but we have likewise found seeds and vegetables in their stomach. In spite of their unwieldiness, they swim with rapidity, and their strength may be conjectured from their size. They bite rapidly, but if the line be not calculated for this giant among the inhabitants

of the rivers of Guiana, it carries off both hook and line. While we ascended the river Parime, we encamped one night at the head of a large cataract, and Sororeng, one of the Indians who accompanied me afterwards to London, went late in the evening alone in a canoe, to try whether he could hook some fish. We were all fast asleep, when I was awakened by some person crying out for help, and we soon ascertained that it was Sororeng, who had hooked a lau-lau, and having got entangled in the line, with neither knife nor other sharp instrument at hand, the fish carried him and canoe at a rapid rate towards the cataract. Armed with cutlasses, we soon came to his assistance, and time enough to prevent him from being carried down; but so eager was he now to secure his prize, when he saw that assistance was at hand, that he begged us not to cut the line, although it had by this time fairly cut into his hand, but to try to slay the monster, which apparently was more inclined to haul the fisherman than the fisherman the fish. It was slain, and when brought on the land, measured eight feet and a half in length.

"This fish, which is very numerous in the upper part of the rivers, might afford sustenance to many, if its fishery were carried on with regularity to a greater or less extent. The lau-lau, as already observed, is delicious, both in the fresh state and when dried; the liver would furnish oil of excellent quality, and we have frequently used the air-bladder, instead of isinglass, for glue."

Before taking leave of this family, we must notice a structure of a very beautiful description which characterises the articulation of the dorsal fin, and seems to be present, so far as we can judge from outward appearance, in most of the families of the Siluridæ. The subject of the annexed engraving,

PLATE X.

Was picked up on the sea-shore at Bombay, and was brought to us by James Inglis, Esq. M.D., who was much struck with the singular structure, for the purpose of ascertaining to what animal it belonged: being occupied at the time in examining some specimens of this family, we immediately set it down as the first dorsal spine of one of the Siluri of India, and our opinion was very soon confirmed by the dissection of a small specimen of one of the Siluri or Pimelodi from North America, which was kindly given to us by Dr. Parnell for that purpose, and where we discovered the very same ringed articulation. It will be for future observers to attend particularly to the uses to which this spine is applied to require so complicated an arrangement. Is it ever struck into its enemies or prey, in attack or defence; and will the ring preserve it from dislocation in the extraction, which would be rendered difficult from the barbed spines?

Among the drawings in the Schomburgk Collection there are no representations of any species belonging to the *Clupeæ* or *Herrings*, with the exception of two rare and remarkable fishes, which, though placed there by some ichthyologists, have been so often removed, and have received so many stations, that in the absence of specimens we prefer noticing them separately, rather than allotting to them any place upon comparatively imperfect information. The first will be typical of the genus

SUDIS, Cuv.

This genus of Cuvier is framed from two or three large fishes, natives of the rivers in Brazil and Guiana, and of the Nile in Africa; and by him it is placed near the end of the Herrings, after *Erythrinus*, to which he considers it also allied. By Agassiz it is placed at the commencement of his *Clupeoidei*, and in the Brazilian Fishes a detailed description of the skeleton is given. In the later "Classification of Fishes" by Mr. Swainson, again, its station is made to be between *Salmo* and *Cyprinus*, or as the connecting link between the carps and the salmon; at the same time, he restricts the genus to the species of America, giving to those of Africa the generic title of *Clupesudis*. In the latter arrangement he will, we believe, be found to be correct, from a difference in structure of the branchiæ. The following are the characters given in the Brazilian Fishes:—

" Caput magnum, depressissimum, extus osseum. Os amplissimum, transversum, in toto suo margine dentibus elongatis, conicis armatum; in palato dentes velutini; ossa inter-maxillaria satis lata marginem superiorem, ossa maxillaria superiora retrorsum subarcuata, angusta, margines lateres maxillæ superioris conformant oculi et nares ad rostri apicem. Membrana branchiostega radiis 11. Corpus elongatum, compressum, squamis magnis osseis tectum. Pinna dorsalis longissima anali opposita ad caudæ apicem usque producta."

GIGANTIC SUDIS.

Sudis gigas, Cuv.

PLATE XI.

Les vastrés, Sudis, *Cuv. Reg. Anim.* ii. p. 327.—Sudis pirarucu, *Spix*, pl. xvi. p. 31.—Pirarucu or Arapaima, *Schomb. Drawings.*

In the drawing of this fish, the head and fore part of the body is more attenuated than in the figure of Spix, and the snout or upper jaw, slightly shorter than the lower, is turned up. The body is entirely covered with large scales, round on their posterior edge, and the base of the dorsal and anal fins, thickened and muscular where they leave the line of the body, are scaled upward, for two-thirds of their depth, or until the rays are given off with a separate dividing membrane; at their termination succeeds

the small caudal extremity, with its very narrow web of rays continued round, appearing, in fact, as if the rayed part of the dorsal and anal fins had been continuous with it, and had formed one large broad extremity formed for powerful sculling. In colour, this fish, on being newly taken, is much more brilliant than in any of the representations which have been given; the head and dorsal part of the body are of a rich umber brown, becoming paler as it reaches the central lateral line, and thence, shading into a brilliant crimson lake, which occupies also the basal or scaled part of the dorsal and anal fins; each scale is darker at its base, and has a narrow line of deeper lake near its border. Near the caudal extremity, the body and scaled part of the fins are blotched with dark umber-brown, the anal fin showing fourteen streaks of the same colour in the direction of the rays. The pectoral and anal fins are grey, having the rays marked irregularly with dull blue. The membranous part of the dorsal, anal, and caudal fins are blackish grey, the rays being reddish brown. Schomburgk's notes are,—

"This fish is plentiful in the Rupununi, Rios Branco, Negro, and Amazon. In the latter three rivers there are extensive fisheries for supplying the different towns, and great quantities are sent to Para, where it is preferred to the fish salted on the North American coast, and commands a higher price. When fresh it is excellent, and the belly nearly all fat. They are taken generally with harpoons fastened on a long pole, which is thrown

from the canoe, and to which is attached a long line to give the fish play, as they are so strong that they cannot be hauled to be killed until they are weakened. This is generally performed with a club of hard wood, with which heavy strokes are inflicted upon the skull. The canoes which are used in these fisheries are sometimes very small, with only a fisherman and a boy to steer. After the fish is killed, they sink the canoe, put it under the fish, and by shoving the canoe backwards and forwards, throw out as much water as allows it to float, the rest is baled out with a calabash, and the fish is transported to the place of rendezvous; it is there skinned and split to an inch thick the whole length of the fish, when a small quantity of salt is sprinkled over it, and it is put at once in the sun to dry, without being allowed to remain in the salt, as is generally done with other fish. In good weather it dries in three days, but it takes much longer in the rainy season, when the fish then cured is not nearly so good or white. They are sometimes taken with the hook and line, baited with other fish.

"The intestines are short, forming only one flexure, which, together with the stomach, are entirely covered with fat. The liver is large and not used for food, but would serve for oil, which it appears to contain in large quantities. In the stomach of one which we opened, several small fish and a quantity of mud were found. It has no air-bag, but a curious process like the lungs of birds covers the spine inside, resembling the honeycombed

inside of a bone. The roe is large, eggs small, and the membrane which contains them resembles in outward appearance the liver of a hog in size and shape. The young are protected by the mother for some time after they leave the eggs, just as in the case of the lau-lau (*Silurus*), and swim generally over her head. They delight in the *kirahaghs*, as those inlets are called which many of the South American rivers form, and where the water is quite currentless. They are sometimes found in water scarcely so deep as to cover them, and the fishermen frequently attempt to drive them on shallow ground, where they fall an easy prey. They are more plentiful in the muddy than in the clear water.

"The Rupununi is the only river in British Guiana where they are to be found; and as during high floods this river is said to mingle its waters with those of the tributaries of the Rio Branco, they may have entered the latter river. They are occasionally carried by the flood, during the inundations, to the Lower Essequibo, where it is known that they have been taken.

"I was assured by the inhabitants of the Rio Negro that they have caught some fifteen feet long and of twelve to thirteen arrobas (410 pounds) weight. The specimen, the skin of which I brought with me, and which is now in the possession of the British Museum, measured, when taken, eight feet one inch in length and three feet seven inches in girth. The caudal fin was only five inches long and eight inches broad, when extended."

The following spirited account of hunting the arapaima is given by our author:—"Partly to serve us for economical purposes, but more to satisfy our curiosity of witnessing the Indian manner of hunting the arapaima, this giant of the fresh-water fishes, Irai-i, the Carib chieftain at Curassawaka, induced his men to afford us an opportunity. We selected a sunny day, when there was more chance that at the heat of noon-tide one of those fishes would rise to the surface. Our party was distributed in five small corials, and we proceeded towards the mouth of the small stream Curassawaka where it enters the Rupununi. Here we remained stationary, one of the corials being put on the watch, and no length of time had elapsed when the signal was given that an arapaima was in sight. All hands were hushed as death: Irai-i and his brother-in-law Dabaero, who were considered the strongest and best shots, went forward with their corial and approached the fish as nearly as possible, the rest following softly to be within arrow-shot. There stood the sinewy Carib, Dabaero, his foot firmly resting upon the bow of the corial, his left hand grasping the large bow of tough *uamara*, his right the long arrow, upwards of six feet in length, and armed with a formidable iron point. His position, although forced to the unpractised, developed the symmetric forms of his figure, unadorned as it was by any art. Only those who have witnessed the Indian's eye, when the bow is strung and he approaches his intended victim, can

have any idea of that expression and that fire by which it appears lighted. * Irai-i had adopted a similar position, when the crack of the bow-string told us that Dabaero had discharged his arrow, and the chief followed his example, but missed, his arrow floating on the water while the other disappeared with the monster. The corials pulled into the middle of the stream, the eyes of the Indians directed to all points to detect the arrow-feather appearing. Their quick eye saw it above the water, although it was only for a moment; away went all the corials in full chase, and just as it appeared a second time, a second arrow was sent into the fish. All was now excitement, and the yell of the Indian, the rushing of waters, harrowed up by the quick stroke of the paddles, was one of the most enlivening scenes I ever witnessed. Away we went where the experienced hunters expected to see the fish reappear, and scarcely made the tops of the arrows their appearance, when others flew from their strings and pierced the arapaima: down he went again, but the period he remained below the surface was much shorter than previously, a proof that he got fatigued, and when he reappeared he allowed

* How frequently has the eye of the Indian, in similar movements, been admired by those who witnessed the bow exercise of the three Indians who had accompanied me to London. The aim they took then was the bull's-eye of the target; and although it distinguished itself by sprightliness, still how far was it on such occasions behind that animation when standing, in lieu of the target, before the game which he intends to secure with his arrow.

the first corial to come so near that one of the Indians was enabled to give him a stroke with a cutlass; a few more arrows were discharged at him, and he became an easy prey. The question was now how to get him into a corial, as we estimated his length at least six to seven feet, and his weight not less than a hundred and fifty pounds. He was floated into comparatively shallow water, and when one of the corials was got under him, the Indians who were wading in the water shuffled the corial with the fish and water in it to and fro, until the water had got mostly out and the craft commenced to float again; the rest was bailed out, and under the huzza of our Indians we returned with our prize to Curassawaka, highly delighted with our sport of hunting the arapaima."

Fig. 2, on Plate X., represents the scales of *Sudis*, from the Brazilian Fishes.

D. 38—A. 30—Ribs, 32 pairs—Vert. 75.

OSTEOGLOSSUM, VANDELLI.

This remarkable genus is also ranged by Cuvier and Agassiz among the Herrings, and they are followed by Swainson, who places it as the first aberrant form in the same family. The original species, *O. bicirrhosum*, Vand., *Ichonosoma* of Spix, is figured in the Brazilian Fishes from the river Amazon, and is represented as large-scaled, of brilliant colours, and with the anal fin continuous with the tail, or appearing, in short, as if there was no real

tail; the dorsal fin placed very far behind, being only separated from it by a very short space, so much so that Swainson has hazarded a conjecture that "it is not really in nature." The drawing made by Mr. Schomburgk we consider to be that of a new and undescribed species; but before noticing it, we add the generic characters:—

"Caput parvum, compressum, omnino nudum. Ossa infra orbitalia buccas omnino obtegentia. Oculi ad rostri apicem. Os amplissimum, dentibus in maxillis, in vomere, in palato et in lingua armatum. Ad symphysin ossium mandibularium cirrhi duo. Corpus compressissimum, squamis maximis tectum; abdomen carinatum. Pinna dorsalis et analis latissima, *haec cum caudali conjuncta.*" *

THE AROWANA OF GUIANA.

Osteoglossum arowana.

PLATE XII.

Carib, Macusi, and L. Geral, Arowana. *Schomb. Drawings*, No. 16.

So far as we can trace, from our notes and drawing, the principal difference between this fish and that figured by Spix consists in the variation of the fin-rays, and in the anal fin being separated from the tail, which is formed as in most other fishes with graduated rays, and not as represented in Spix, a

* Italics should be omitted.

continuous fin surrounding the extremity, and only wanting a short space to unite it to the dorsal membrane; the dorsal fin also is longer and extends farther forward. The sketch is very slight, but at the same time perfectly defined; and the colours seem to be equally brilliant with that given by Spix. Our notes remark, "This fish is not uncommon in the Rupununi, although few if any are found in the Essequibo. In the Rio Branco they are also pretty plentiful, though scarce in the Rio Negro, which receives its waters. They delight in the muddy waters, and feed on grass and other vegetable substances. They swim near the surface, and are killed by the arrow. The body is long, much compressed at the belly, and ends in a sharp keel. The tail round, dorsal and anal fins nearly half the length of the body, pectorals very large, ventrals small. It is of a beautiful light green colour, lighter on the belly, and having each scale edged with red, blue, and purple. The lower jaw is produced; nostrils double; eye yellow, situate near the snout; teeth fine, thickly set in both jaws, and on the palate. The gill-bones are all striated. Scales very large, deciduous, smooth at the edges. The lateral line commences near the top of the head, bends towards the middle of the body, and runs thence to the middle of the tail. The ventrals are placed far behind the pectoral fins. There are two short cirrhi on the lower jaw. The tongue is pointed, intestines straight; the air-bag single, aud runs the whole length of the cavity of the body. They are

a general article of food among the Indians, and are well-tasted but bony, and do not keep long after being killed." The size is not given, but it appears to grow to some length; that of *O. bicirrhosum* is stated as twenty-four inches.

O. arowana,—

D. 46—P. 7—V. 6—A. 55—C. 12—Br. 7—Vert. 92.

O. bicirrhosum, from Spix,—

D. 42—P. 7—V. 6—A. 56—C. 6.

The next family of which specimens or drawings occur is that of the Salmon, which naturally seems to stand between the True Herrings and the Carps or *Cyprinidæ*. In placing some of the genera we have found considerable difficulty, particularly in the stations which *Erythrinus* and *Prochilodus* should stand; both are connecting forms; and it seems in a manner necessary that we should have one among the Salmon without the adipose fin, while a Carp might be expected with it. The two genera above mentioned stand in this manner, but both have in a great measure the internal structure of the Carps. By Cuvier and Agassiz, *Erythrinus* is placed among the Herrings; by Swainson it is put among the Carps; while, by both, *Prochilodus* is arranged among the Salmons. It is farther observations, with dissection, which alone can ultimately settle these points, when the facts to be ascertained have been pointed out to inquirers; but for the present we have thought it

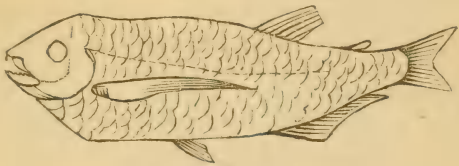
best to place *Erythrinus* at the end of the Salmon, as allied to them in dentition and habits, and as passing to the other by external form and the want of the adipose fin; while *Prochilodus* is removed to the Carps, some of them appearing to be so in every essential, the presence of the adipose fin excepted. Passing from the True Herrings then, the genera which appear to represent them among the Salmon are *Coregonus*, *Anodus*, *Chalceus*, &c. In the warm regions of South America, we are not aware that any examples of the typical Salmon have been discovered; none occur in the present collection, and the place of *Coregonus* seems supplied by *Anodus* and *Chalceus*, which are tolerably abundant in many of the rivers and lakes in Guiana. We shall first take the genus

CHALCEUS.

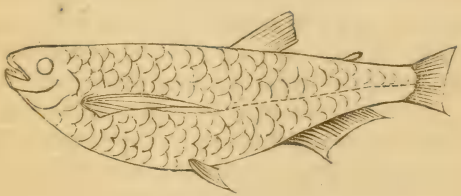
In the outward form of several of the species we are reminded of the Herrings, a resemblance still more increased by the large scaling, the posterior position in which the dorsal fin is often placed, and in the elongated form of the anal fin. These will be seen in the outline figures given with our first description. In structure, it will be observed from our notes that they are equally remarkable by an alliance to the Carps in a double air-bladder, while their habit of feeding on vegetables brings them still nearer. The generic characters, as given in the Brazilian Fishes, are,—

" Caput mediocre, supra latum, lateraliter subcompressum. Oculi magni, laterales. Os mediocre, transversum, apertum, quadratum ; mandibula prominens. Dentes acuti, minutissimi in parvis ossibus maxillaribus lateralibus et in serie anteriore ossium inter-maxillarium totum labium superius in medio sustinentium ; in mandibula et in serie posteriore ossium intermaxillarium, dentes maximi, multicuspides, cuspide medio majori, magis prominente. Lingua papillosa. Membrana branchiostega radiis 4 gracilibus. Corpus latum, compressum, squamis magnis obductum. Pinnæ mediocres, analis latissima."

CHALCEUS ROTUNDATUS. — L. GERAL, Araisiri. *Schomb. Drawings*, No. 54.



C. angulatus, Spix.



C. rotundatus.

This fish seems nearly allied in general form, and in the position of the fins, to the *C. angulatus* of

Spix; but that differs in the contrasted angular outline, the direction of the lateral line, and the comparative length of the pectoral fins. The first is from the rivers of Southern Brazil; the second was taken in January in the river Padauiri. The size is stated to be from six to seven inches in length (that of the drawing). "The scales are smooth and elliptical, very deciduous; teeth are a single row in each jaw, the tongue round and fleshy, the intestines are straight, and the stomach was found filled with cassada which had been left on the river's bank to steep. The air-bag single, as long as the cavity of the abdomen.

C. rotundatus,—

D. 11—P. 11—V. 7—A. 26—C. 22—Ribs, 14 pairs—Vert. 36.

C. angulatus, Spix,—

D. 1/10—P. 12—V. 7—A. 4/28—C. 5/17/5.

Our next species is of a larger size, and is more typical in form.

C. ? TÆNIATUS, BLUE-BANDED CHALCEUS.—ARAWAAK, Caborisi; WARRAU, Hua; L. GERAL, Jatuarana. *Schomb. Drawings*, No. 3.—"The length is from fifteen to eighteen inches, depth six. It is an inhabitant of the river Essequibo, as well as of the Rios Negro and Branco; it is esteemed a great luxury, and is taken by the hook, baited with small fish. The body is silvery, with light blue stripes; head and dorsal fin greenish; pectoral and ventral fins silvery, the latter tipped with black; anal fin tipped with blue, greenish yellow in the middle,

and black near the base; tail slightly forked, and similarly coloured; scaling large, the edges slightly fringed, adhesive; there is no lateral line perceptible; head laterally depressed; eyes near the middle of the head, iris red and yellow; mouth terminal, tongue fleshy, jaws nearly equal; teeth, a single row in the under jaw, upper jaw has a series thickly studded on the roof, which are serrated; gill-covers slightly striated. They live only a short time when taken out of the water, and soon lose their colour, turning to a duller blue. Feeds on fruit, as well as on animal substances. Air-bag double; intestines form flexures, and have appendices; milt half the length of the cavity of the body."

This is a very handsome species, and is coloured bluish grey above, changing to silvery white on the sides and belly; and the whole is relieved by eight delicate blue longitudinal stripes. The structure of the teeth varies from that of the others.

D. 11—P. 14—V. 8—A. 26—C. 25—Br. 4—Vert. 38.

THICK-LIPPED CHALCEUS.

Chalceus labrosus.

PLATE XIII. Fig. 1.

L. Geral, Sardino. *Schomb. Drawings*, No. 55.

This small and delicately marked species seems typical in form, and has the same elongation of the anal fin which we saw in the last, but seems marked by the maxillary bones being more than usually elongated, and by their apparently forming the whole margin of lips. "It was taken in the river Paduiri in March. The scales are rather large, elliptical, smooth, and deciduous; the lateral line is curved, and runs nearest the belly. The tongue is round; teeth, a row on each jaw, three rows on the roof of the mouth. The intestines form flexures and have appendices. The air-bag is double,—one half long and pointed, the other oval. It is short-lived after being taken from the water." Our drawing is in length five inches and a quarter to the centre of the fork. The form is of a rounder oval outline than among the Coregoni, and the lateral line is placed lower. The colour of the body is of a silvery bluish grey, darker on the back; that of the fins a bluish

green; the pectoral elongated, but not so much in proportion as that of the preceding fish; the dorsal placed above the centre of the ventral fin. The anal fin is deeper in general tint, and has a broad black mark running from the centre of its anterior edge for one-third of its length. The tail is of a bluer shade than the other fins, and has a dark bluish black bar running across, parallel to the fork. The colour of the iris is yellow.

D. 10—P. 12—V. 8—A. 23—C. 24—Ribs, 16 pairs—Vert. 37.

BLACK-STRIPED CHALCEUS.

Chalceus? nigro-tæniatus.

PLATE XIII. Fig. 2.

L. Geral, Waracu. *Schomb. Drawings*, No. 53.

This curiously marked fish we have placed in *Chalceus* with a little doubt; it wants the elongated anal fin, and in form closely resembles a Coregonus. It was a male; "from fourteen to sixteen inches in length, and was taken with the hook at Pedrero on the Rio Negro. The stomach was filled with cassada roots, which had remained on the banks of the river and were rotten. The scales were large, ellip-

tical, smooth, and adhesive; lateral line straight, along the middle of the body; teeth prominent, a single row in each jaw; tongue round and fleshy; intestines without any appendices; milt double, running the length of the cavity; air-bag double,—the one long and pointed, the other oval." As the drawing is coloured, the head and back are dark olive green, the colour shading gradually to the lateral line, where it becomes pale yellowish white for the remaining half of the body; all the fins are of a uniform dull green, but the singular marking of the fish is a deep black stripe of about half an inch in breadth, which runs on the lateral line from the centre of the fork of the tail, and terminates at two-thirds the distance between the ventral and anal fins. The vent is situate half an inch anterior to the commencement of the anal fin.

Another fish seems to range here, although the shape is somewhat similar both to Serrasalmo and Tetragonopterus. Our notes, however, rather agree with the present genus.

C.? LATUS, BROAD-FORMED CHALCEUS.—L. GERAL, Matapuri. *Schomb. Drawings*, No. 51.—"It was taken by the hook in the Padauiri, a tributary of the Rio Negro. The length is four inches to the centre of the fork, while its depth below the dorsal fin is two inches and a quarter. The scales are large, elliptical, deciduous, and slightly fringed on the posterior edge; lateral line runs near the middle of the body, slightly bending near the head. Tongue is oval; teeth, a single row in each jaw; intestines

have no appendices; roe double, about one-third of the length of the cavity; air-bladder double, the first long and pointed, the other shorter and oval." The head is coloured pale olive, the iris golden yellow; the body bluish grey above, shading into silvery at the lateral line and on the under parts; pectoral and ventral fins grey and pale. The other fins greenish blue, and as dark as the tint of the back."

D. 11—P. 13—V. 8—A. 21—C. 24—Br. 4—Ribs, 10 pairs—Vert. 29.

Chalceus fasciatus, Ten-banded Chalceus.—Arawaak, Darra; L. Geral, Warracu. *Schomb. Drawings.* — "This fish was killed in the Rio Padauiri, but they are said to be found also in the Curantu. They grow to eighteen inches in length, are of a yellow-ochre colour, with several bands of black (in the drawing ten); the belly is rather lighter, the fins greenish. The head oval, something like that of a mullet; teeth in both jaws, single rows, but more in the roof of the mouth; adipose fin small, and caudal fin slightly forked. The eye situate near the middle of the head, with yellow raised iris. The lateral line straight, running along the middle of the body; the gill-lid is smooth and opening semilunar, and the vent is placed near the anal fin. They feed on fruits, and are killed chiefly by the arrow. They are fat and well-flavoured, and much esteemed for the table."

D. 12—P. 13—V. 10—A. 9—C. 22.

The next fish, if really entering this genus, is equally remarkable from its large scaling, and seems referrible to the species described by Cuvier as noted below. It is probable, however, that, with *C. tæniatus*, it may range elsewhere.

LARGE-SCALED CHALCEUS.

Chalceus macrolepidotus.

PLATE XIV.

Chalceus macrolepidotus, *Cuv. des Museum*, t. iv. pl. 21, p. 454. —ARAWAAK, Arara-pira; MACUSI, Parshama; L. GERAL, Arara-pira or Macaw-fish. *Schomb. Drawings*, No. 5.

"THE fish from which the drawing has been made was caught at the Camuti mountain, in Essequibo, in October. It grows to the length of fifteen inches, and about five deep. It is beautifully shaped; the scaling very large, elliptical, smooth at the edge, deciduous; no lateral line visible; head depressed. Ventral fin placed under the dorsal, of a greenish colour, with tip of lake; dorsal and pectoral fins, ditto; anal, ditto, mixed with carmine; and caudal, carmine. The scaling is of a beautiful bluish silvery, varying to green on the back, and each scale has a border of blue. The head greenish, opercles

silvery; nostrils single, oval, placed on the snout. Eyes near the middle of the head, iris black and yellow; tongue fleshy; teeth, three rows in the upper and one in the lower jaw; jaws nearly equal. Vent situate near the anal fin; gill-opening semilunar; opercles smooth, with smooth edges. Lives but a short time when taken from the water. Takes bait, but is often killed by the arrow. Feeds on fruit, insects, and small fish; is esteemed for food. They are rather scarce, only one specimen having been killed during the expedition.

D. 11—P. 15—V. 8—A. 12—C. 20—Br. 4—Vert. 34.

There is a good deal to observe correctly in the internal structure of these fishes and allied species; they vary from each other in some having the air-bladder single, others double,—and in some having appendices to the stomach, others being without. They are remarkable also as feeding on vegetables, at least in part. The next elegantly formed fish we have referred to

ANODUS.

"Anodus, *Spix.*—Caput mediocre, supra rotundatum, lateraliter compressum. Oculi magni laterales. Os parvum, transversum. *Dentes nulli.* Ossa inter-maxillaria magna, totum labium superius sustinentia; maxillaria superiora minima, lateralia; mandibula prominens. Lingua apice libera. Membrana branchiostega radiis 5. Corpus squamis minimis obtectum, elongatum, subteres, lateraliter subcompressum. Pinnæ mediocres."

BLACK-MARKED ANODUS.

Anodus? notatus.

PLATE XV.

Schomb. Drawings, No. 61.

We have marked the genus of this fish with a ? as "Dentes nulli," in the generic characters of Spix, will not agree with it; although, if the genus is a good one in other respects, that character may require modification. Our notes remark, "Do not take bait; the specimen jumped into the canoe when passing a sand-bank on the Rio Negro. The scales are middle-sized, smooth, elliptical, and deciduous; lateral line straight, along the centre of the body; teeth, a single row in each jaw; tongue round, fleshy; intestines form two flexures, and have no appendices; milt extending half the length of the cavity of the abdomen; air-bag double."—The drawing, of the natural size, is in length six inches and three-quarters to the centre of the fork of the tail, and seven inches and a quarter to the tips of the lobes. The head is pale olive, approaching to yellowish on the opercle. The body above is

a bluish grey, changing to silvery on the sides and belly. Above the lateral line, between the ventral and anal fins, or nearly in the middle of the fish, there is an oval spot of deep black. The dorsal fin is uniform bluish green; the other fins dark but more tinted with yellow, and across the tail there is a dark bluish green bar parallel with the fork. The vent is placed anterior to the insertion of the anal fin. It is probable that this with the last may be congeneric, as they agree in several particulars, and vary from the characters of *Anodus* as given above.

D. 11—P. 17—V. 11—A. 11—C. 25—Br. 4—Ribs, 22 pairs—Vert. 40.

SERRASALMO.

We have drawings of several species whose correct station it is extremely difficult to determine from figures only. The characters of *Serrasalmo*, *Tetragonopterus*, and *Myletes*, as given by Spix and Cuvier, running very much into each other, and, so far as we can judge, being to a certain extent artificial. We give the characters of the three from Spix's Conspectus Generum, for comparison, but have placed most of the species under the first, though by no means asserting that they should permanently stand there.

"SERRASALMO, *Spix*.—Caput magnum, lateraliter compressum. Oculi magni laterales. Os amplum, armatum, transversum. Dentes maximi, acutissimi, latissimi per

seriem simplicem in mandibula prominente, et in maximis ossibus inter-maxillaribus totum oris superiorem marginem conformantibus. Ossa maxillaria superiora minima ad commissuram maxillarum transversa. Lingua apice libera. Membrana branchiostega radiis 4 latis. Corpus compressissimum, latissimum, squamis minimis obductum ; abdomen carinatum serratumque. Pinnæ mediocres, dorsalis latior, analis latissima."

We begin with the drawing which we consider identical with the *Piranha Saw-bellied Salmon* of the Brazilian Fishes, being given by both Agassiz and Cuvier as characteristic of the genus, and have figured it to show the colours, taken from the living fish, and appearing much more brilliant than any representation hitherto published.

PIRANHA SAW-BELLIED SALMON.

Serrasalmo piranha.

PLATE XVI.

Serrasalmo piranha, *Spix*, tab. xxviii. p. 71. *Schomb. Drawings*, No. 30.

"THIS fish grows ten or eleven inches in length, and is plentiful in the Rio Branco, where they are killed by the hook and line in great numbers, being very voracious, and taking the bait eagerly. The upper part of the body is lead colour; belly, pectoral, ventral, and anal fins vermilion; the body is compressed, back high; teeth sharp, triangular, serrated, in single rows; jaws remarkably strong. Eye near the middle of the head. Lateral line bent near the head, otherwise straight. Opercles striated, with smooth edges. Gill-opening semilunar; nostrils double, situate in a cavity near the snout. Vent near the anal fin."

The figure and notes above will give an idea of the brilliant colour which tints the lower part of the body, and which seems to be changed to a dingy yellow by being kept in spirits.

Schomb.	D. 17—P. 17—V. 7—A. 30—C. 30.				
Agas.	4/15	15	5	3/28	8/19/8

Another drawing resembles the last, but is considered to be distinct both by Mr. Schomburgk and the Indians. It differs in the colour of the upper part of the body, in the form of the adipose fin, which in the last seems to have indications of rudimentary rays, and no spine is represented anterior to the dorsal fin; it possesses the same brilliant colouring of the gill-covers and belly. These may be incidental also to particular seasons.

SERRASALMO STAGNATILIS, THE POOL SAW-BELLIED SALMON.—MACUSI, Arri. *Schomb. Drawings*, No. 23.—"This fish seldom exceeds eight inches in length, and is found in the Upper Essequibo. The head is greenish; gill-lid, belly, pectoral, ventral, and anal fins vermilion; body blue; caudal fin greenish. The eye is yellow; nostrils single, placed near the eye. Opercles striated. Lateral line is nearly straight, a little bent near the head, and running along the middle of the body. Body compressed, ending in a keel; teeth sharp, triangular, serrated; jaws strong, the lower slightly produced. Its resorts are in standing pools, called *kirahaghs*, where they live an enemy to every other tribe, and are not less voracious, although armed with less power, than its kindred fish, the pirai." (Plate XVIII.) The length of the drawings is stated to be eight inches and a half; the depth of the fish, below the dorsal fin, three inches and three-quarters.

D. 17—P. 15—V. 6—A. 32—C. 26—Ribs, 12 pairs—Vert. 35.

Of our next drawing, which is allied to the two preceding in its shape and colouring, we have no notes; we have given a copy from it, with the provincial Indian names written upon the drawing.

SPOTTED SAW-BELLIED SALMON.

Serrasalmo punctatus.

PLATE XVII.

Macusi, Katte; L. Geral, Chitao. *Schomb. Drawings*, No. 23, B.

The outline is an oval, regular, and without so many angular undulations as the two last presented; above, the colour is bluish grey, shading into white, perhaps silvery, before reaching the lateral line, and which covers the remaining part of the lower parts, contrasting sharply with the deep vermilion which colours the opercula, all the lower fins, and the tail. The dorsal fin is bluish olive at the base, shading to yellow at the upper edge; and this member, with two-thirds of the body, is spotted over with minute, round, black spots. The lateral line undulates at its commencement, but often runs straight to the tail; lower jaw projects about half

an inch, and both are armed with strong triangular teeth. The vertebræ are stated at thirty-five.

The Collection possesses two drawings of one fish, which approaches very near to the *S. nigricans* of Spix. The specimen from which the figure in the Brazilian Fishes was made was only four inches and a half long, and the lighter colour may be owing to a younger state. Our drawing, at the same time, shows a fish rather deeper in proportion, and there is no anterior dorsal spine represented. Another circumstance of variation occurs in the shape of the pupil, which spirits could not have changed; in Schomburgk's drawing it is elliptical, and it may be worth the while of future observers to attend to the cause of this form. We place the Guiana fishes, for the present, distinct.

BLACK SAW-BELLIED SALMON.

Serrasalmo niger.

PLATE XVIII.

ARAWAAK, Huma; CARIB, Pirai; MACUSI, Arai; L. GERAL, Piranha (meaning Sharp Fish). *Schomb. Drawings*, No. 4.

"THIS most voracious fish is found plentifully in all the rivers in Guiana, and is dreaded by every other inhabitant or visitant of the river. Their jaws are so strong that they are able to bite off a man's finger or toe. They attack fish of ten times their own weight, and devour all but the head. They begin at the caudal fin; and the fish being thus left without the principal organ of motion, is devoured with ease, several going to participate of the meal. Indeed, there is scarcely any animal which they will not attack, man not excepted. Large alligators, which have been wounded on the tail, afford them a fine chance of satisfying their hunger, and even the toes of this formidable animal are not free from their attacks. The feet of ducks and geese, which are kept in the neighbourhood where they are plentiful, are almost invariably cut off, and young

ones devoured altogether; and in these places it is not safe to bathe, or even to wash clothes in the river, many cases having occurred of fingers and toes having been cut off by them. They vary in colour from lead-colour to nearly black; the eye is situate near the middle of the head; scaling rather small, smooth at the edge, oval, and adhesive. Lateral line runs near the middle of the body, bending from the top of the opercle. Head and body depressed; ventral fins, under the dorsal, large and strong; nostrils oval, double, situate near the eye; tongue fleshy; lower jaw produced; teeth triangular, serrated, and very sharp,—six on each side of upper, and seven in the lower jaw; vent near to the anal fin; gill-cover striated, with smooth edges; gill-rays 4,—are not covered by the gill-lid, but free, and extend from its lower margin towards the throat; the opening semilunar. They live about half an hour after being taken out of the water; air-bag is long and double. They are a principal article of food amongst the Indians, and as they are so voracious, they are easily taken by hook and line, which is secured near the hook with a piece of tin to prevent cutting. Their flesh is dry and indifferent, and rather bony. It is, however, a good relish while the Indian is travelling in the rainy season, when other kinds are not to be obtained. The belly is serrated.

"The pirai, or huma, by which name the fish just described is generally known to the aboriginal

tribes of British Guiana, inhabits the rivers which intersect that fertile colony. They are not to be found within forty miles of the coast, nor are they plentiful at the upper part of the rivers. Their favourite haunt appears to be those parts of the rivers which are between a hundred and a hundred and fifty miles from the coast, chiefly if there be large blocks of rock, about which they hover to procure themselves worms, &c. The ovary in the female is double. They deposit their spawn in the currentless inlets which form so peculiar a feature in the rivers of Guiana; this occurs during the months of January and February, at which period we found the females generally destitute of roe.

"While we ascended the river Cabalaba, a tributary of the Corentyn, from the east, we observed a river-cavia (*Hydrochaerus capybara*) with five young ones, out of which number three were captured; and all were deficient in their toes, they having been bitten off by the pirais.

"Whilst we were continuing our course on the river Corentyn, one morning, an object was observed to drift into the middle of the stream, around which there appeared to be a great commotion. The telescope did not assist us in coming to a conclusion what it might be; and though we were in-shore, stemming a strong current, I ordered the corial to paddle for it. When we came near, we observed the head of a large luganani or sun-fish (*Cychla ocellaris*), which was surrounded by numerous pirais,

tearing off large parts of its flesh. We secured the luganani, which might have measured from twenty to twenty-six inches, and though the poor animal had been eaten off piecemeal to within its pectoral fins, it was still alive. Being deprived of its tail and lower fins, it drifted perpendicular. The corial was brought to, our hooks and lines were soon out, and we caught several of the depredators, which, with the remnant of the luganani, afforded us a good breakfast.

" The ducks and geese are equally exposed to the attacks of the pirai, and those which the settlers keep near the banks of the river are generally deprived of the lower part of their feet. It is a strange sight to see them walking on mere stumps. In Wicki, a wood-cutting establishment at the river Berbice, there were two *vicissi ducks* (*Dendrocygna viduata*) which had been perfectly tamed by the Indians, and were brought from the large ponds in the interior. Unacquainted with the danger which the ravenous pirai offered them, their instinct directed them to their favourite element, and one of them paid its first visit with the loss of its toes, and the other was similarly injured in its future visits. They now became cautious, and it was remarkable to observe how studiously they kept in-shore. and never trusted themselves beyond their depth.

" The pirai is from nature a tyrant, and connects with it the greatest voraciousness. I am almost persuaded that it surpasses the ravenous pike, though the latter, *par excellence*, is called the tyrant of the

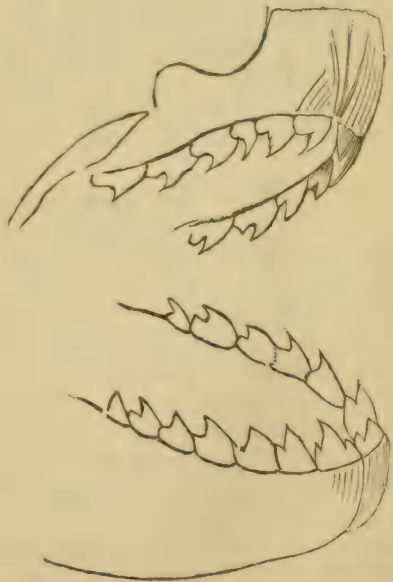
watery plain! They are caught with hook and line, and their greediness is so great, that no art is necessary to conceal the bait. The hook may be baited with a piece of fish, bird, or animal, or merely their entrails; the pirai will dart at it the instant it is thrown into the water, and seize it with eagerness; but it frequently happens that, with its sharp teeth, it bites the line and escapes with the hook in its mouth. We therefore surrounded the line, where it was fixed to the hook, the length of two or three inches, with tin or lead; and though it had a clumsy appearance, we were not less successful. Some precaution is necessary, even after the fish has been lifted out of the water, or it will inflict, in its struggles, serious wounds; the angler has therefore a small bludgeon ready, wherewith its skull is broken.

"Like the Balistes, several species of Silurus, &c. the pirai utters sounds when raised above the water; they resemble the grunting of a hog. Its vivaceousness is great, and it will live for hours after it is taken out of the water.

"The flesh is firm, white, and well-tasted; nevertheless, many colonists scruple to partake of it, in consequence of its greediness, and the report, which appears but too well founded, that when there is a deficiency of other food they will not decline carrion; it partakes, therefore, in that regard, of the nature of several of its congeners.

The length of these specimens was sixteen inches, by the half in depth below the dorsal fin. The air-

bag is stated to be single and oval. The colour of the drawings is deep bluish black, paler on the lower half of the fish, and there, as well as on the opercula, appearing to have a golden or bronze tint, as represented in the two allied species of Spix, *S. aureus* and *nigricans*. All the fins are of a very deep shade of the same colour; the iris is coloured of a rich lake. The wood-cut beneath represents the size and form of the teeth in the specimens mentioned.



Formula of fins, &c. :—

D. 18—P. 16—V. 7—A. 36—C. 23—Br. 4—Ribs, 16 pairs—Vert. 34.

Our next three drawings are of a smaller size and more delicate form, and would approach nearer to the type of that figured by D'Orbigny as *S. marginatus;* one, indeed, is somewhat allied to that fish, but is much deeper, and wants the rich black border fringing the anal fin, though it possesses the red band within it. As a contrast, it may stand now as

RED-BORDERED SAW-BELLIED SALMON.

Salmo emarginatus.

PLATE XIX.

Schomb. Drawings, No. 72.

No notes accompany this figure. The dorsal outline is very irregular from the insertion of the first dorsal fin to the commencement of the caudal fin. The head is proportionally small. The body above the lateral line is bluish grey, becoming paler towards the line; below, it shades to white or silvery.

The dorsal fins and tail are greenish umber-brown, adipose pale greenish, tipped with red,—the former has a dark clouded band across it, and is furnished with a rather strong spine anterior to it; the pectoral and ventral fins are greyish brown; the anal is greenish brown at the base, bordered with a rather broad border of clear red. Iris is coloured yellow. The lateral line seems straight, except a slight undulation at its commencement; the mouth is small, and the teeth comparatively fine.

D. 17—P. 15—V. 7—A. 40—C. 28—Br. 4—Ribs, 14 pairs, large—Vert. 34.

S. UNDULATUS, WAVE-LINED SAW-BELLIED SALMON. — L. GERAL, Chidova. *Schomb. Drawings*, No. 52.—The drawings of this small species show a different proportion from the last. The head is proportionally much longer, the under jaw projects, and both are armed with rather strong teeth. The dorsal outline is undulated to a less degree than the last, but the adipose fin is situate remote from the tail, and rather nearest to the dorsal. Another remarkable peculiarity is in the lateral line performing three distinct undulations in its length, as in the line below.

The upper part of the body is bluish grey, shading to white or silvery above the lateral line, continuing thence over the belly and vent, and towards the tail becoming yellowish. The two dorsal fins and tail are blackish brown; the first has an anterior spine, and a distinct dark band nearly through the centre; the latter is considerably forked, and darkest near the base. The three lower fins are umber-brown, the anal darkish toward the tip, and thence slightly tinted with light red. The iris is coloured yellow.

"Taken in the river Padauiri, in January; grows to six inches in length, and takes bait. Scales small, fringed, deciduous; tongue round, fleshy; teeth, single row, sharp, triangular, serrated; air-bag double. Food, the roe of other fish."

D. 17—P. 13—V. 6—A. 32—C. 28—Br. 4—Ribs, 12 pairs, large—Vert. 33.

SERRASALMO SCOTOPTERUS, DARK-FINNED SAW-BELLIED SALMON. *Schomb. Drawings*, No. 64.—This drawing is still more longitudinal in form than the two preceding, but keeps the general characters. The dorsal outline is very undulated, and rises suddenly from the head in a hump; the head is large, and rather elongated; the rictus is large, and is supplied with large angular teeth. The general colour, until slightly below the lateral line, is greyish blue, changing to white or silvery below; all the fins are very dark, and contrast with the pale greyish blue tint of the body; the two dorsal,

caudal, and anal fins are dark bluish green, the first with the dark band across, which we have seen in the two former fishes; the second dorsal nearly equidistant between the first and the tail. The tail is somewhat forked, but with the lower lobe unequally elongated, and near the tip a dark band borders on the edges. The pectoral and ventral fins are small in proportion, and are greenish brown. The iris is coloured orange red. Notes state, that the " scales are small, elliptical, fringed, and somewhat adhesive; the teeth are a single row in each jaw, large and serrated; opercula are striated; tongue is round and fleshy; the intestines have no appendices; air-bladder double,—the first oval, second long and pointed. Taken in the Rio Branco in April, with the hook baited with fish."

D. 15—P. 10—V. 7—A. 31—C. 25—Ribs, 11 pairs, large—Vert. 33.

MYLETES, Cuv.

The fish which we place in the genus Myletus of Cuvier is of a clumsy and unsymmetrical form; and our author, from examination of the teeth, seems to have considered it referrible to this. The Myletes of Agassiz, in the Brazilian Fishes, comes closer to *Tetragonopterus* in external shape, and can only be separated by the form of the teeth.

"MYLETES, *Cuv.* — Caput magnum, compressum. Oculi magni, laterales. Os magnum, transversum; apertum quadratum. Dentes maximi, crassi, molares per seriem simplicem in mandibula, per duplicem in ossibus intermaxillaribus maximis totum marginem superiorem oris conformantibus; ossa maxillaria superiora minima, ad commissuram maxillarum perpendicularia. Lingua lata, apice libera. Membrana branchiostega radiis 5 tenuibus. Corpus compressissimum, latissimum, squamis minimis abductum; abdomen carinatum serratumque. Pinnæ mediocres, analis maxima."

We should observe here, that the appellation of *Pacu*, made into a generic name by some, seems to be a provincial name for several species,—thus the *Prochilodi* have it applied to them; the fish represented on our next plate, however, is that to which it most properly belongs, and they seem to be held in equal estimation both by natives and Europeans.

PACU OF GUIANA.

Myletes? pacu.

PLATES XX. AND XXI. MALE AND FEMALE.

Pacu of the Natives. *Schomb. Drawings*, No. 101, A.; No. 101, B. Male and Female.

"SNOUT short, and terminates in a small mouth; lips fleshy; two rows of teeth on the inter-maxillary bone; teeth in sockets, nine in the lower and nine in the upper jaw, resemble much the molar teeth of sheep, chiefly the three middle ones; there is, however, likewise an acute tooth in the lower and four in the upper jaw, the upper ones forming a double row with the molar-like teeth. Body elliptical, rather compressed; belly almost trenchant, and obscurely serrated; fins supported by cartilaginous articulated rays; head covered with a naked skin; nose double; body descending suddenly towards the mouth; air-bag of moderate size; lateral line distinct and curved. Colour a brownish red, with several blackish spots in the vicinity of the dorsal fin; there are likewise four fasciæ of the same colour towards the tail, two below and two above the lateral line. The rays of the fins are

cartilaginous, articulated,—the membrane marginated; the anal and caudal fins are more fleshy than the rest. Their impregnation is internal; the testes of the male are flat, and contain a liquor, but no matter resembling milt. The female distinguishes itself by the darker colour and the different shape of the part of the body towards the vent, which projects more, and causes likewise a difference in the shape of the anal fin. Male and female are about sixteen to twenty-four inches long, and weigh from six to ten pounds.

It is remarkable that the fry of the pacu is not known at the lower part of the rivers. The general belief among the fishermen is, that at the period the rivers overflow their banks, the pacu proceed up towards the savannahs, where the females deposit their eggs; having performed that duty, the parents return towards the granitic dykes of the Essequibo and Mazaruni, in order to feed upon the *weyra*,* its principal and favourite food. When feeding, the fish turns on its side, in which position, in consequence of the formation and articulation of its mouth, it is enabled to do it more conveniently. While thus engaged, the pacu is so intent, that it permits the fisherman to approach it within a few

* Different species of *lacis*, and other *podostemaceæ*, are called *weyra* or *huya*, and cover the granitic rocks while under water; but when the river subsides and they are exposed to the air, and not further immersed, they commence to wither. The flowers are produced above the water; and by the time the rocks are dry, the seeds fall between the crevices, and germinate when the water commences to rise again.

feet, and it is shot with either of the arrows described already in the Introduction, and figured on Plate I.*; but as they swim so rapidly, and are besides very strong, the reed of the arrow is thicker than the generality which are used for shooting fishes. At the period the rivers commence to fall, after the long rainy season, which is generally towards the end of September and beginning of October, they are very numerous at the first and second series of cataracts on the Essequibo and Mazaruni. The people of the Lower Essequibo undertake fishing expeditions at this period, and the extensive rocky dykes afford them the means of salting and drying the fish, which they bring to Georgetown. Where the *weyra* grows plentifully, and the locality permits it, a spot is enclosed with wooden hurdles or a wall of loose stones, leaving two narrow spaces for the fish to enter, which, when it is considered that a large number have entered, are closed up; and the fish are thus confined in a kind of pond, where it is easier to shoot them than when at perfect liberty. They are likewise fond of the seeds of the *Caladium arborescens*, or *muccu-muccu*, which are thrown into the stream, and when the fish rises in order to seize it, they are shot. Fishermen skilled with the bow and arrow thus secure from two to three hundred pacus in the course of a week, which, when cured, are sold in the colony for about sixteen pence a piece.

"It is one of the most favourite fishes among the epicureans, when it can be procured fresh; but

likewise in its salted state it is not to be despised. During our expedition in the interior, we were always delighted when we reached the regions which the pacu frequented; and when well dressed, according to the colonial fashion, with *cassanipe*, a kind of ketchup prepared from the juice of the cassada-root, it forms an excellent viand.

"The *morocoto*, *cartabac*, and a species of *pacu* which we found in the river Parama, and which differed only from the common pacu in its colour being black, constitute a group of fishes which resemble each other by structure, teeth, habits, and their being phytivorous. One of the most delicious among this division is the *morocoto* or *osibu* of the Warraus; it inhabits only the estuaries, and does not occur in fresh water; it would fall, therefore, out of the limits of the present descriptions; but as it is so closely allied with the pacu, I shall mention at least its dimensions and general appearance. The teeth, which consist of fourteen in the upper jaw, and are placed in a double row in the fore part, are all distinctly molar or grinding teeth. It attains a length from about twenty-five to twenty-eight inches, and is twelve inches in depth. The gill-covers consist of three strong bones, the dorsal fin of sixteen rays, the ventral of eight, and the anal of twenty-four, the caudal is compressed and thin; in every other respect it resembles the pacu, and is extremely fat and delicious. During the month of August, when they feed upon the fruit of the *caramacata*, a tree of large size and very hard wood,

and the bark, leaves, and fruit of which is extremely bitter, their flesh has a bitter taste, but otherwise it is much sought after, and large numbers of it are occasionally brought from the mouth of the Orinoco to Georgetown. It forms the chief support of the Warrau Indians who inhabit the coast regions in the vicinity of the estuaries of the Orinoco and the mouth of the Guainia and Barima. They possess great skill in securing them with bait, for which purpose they employ the fruits already mentioned, or they shoot them with the arrow, in which they are equally expert as the other Indian tribes. It is amusing to see the stratagem the Warrau uses to ensure his success. Acquainted with the predilection the morocoto has for the caramacata fruits, the Indian, after having provided himself with a number of those fruits, selects a spot where no trees of the description are growing along the banks, and having selected his place, he throws a few of the fruits as an allurement on the water where there is little or no current, and while the morocoto rises to the surface in order to seize the fruit, which it can only effect by turning itself partly round, the skilful archer pierces the fish with his arrow.

"The *palometo*, which is about fourteen inches long and seven inches in depth, its body compressed and flat, with a thin sharp belly, is equally well flavoured as the morocoto and pacu, and frequents similar haunts as the morocoto.

"I observed a species, different from the pacu, which inhabits the falls of the Essequibo and Maza-

runi, at the cataracts of the Paramu, a tributary of the Orinoco which joins that river above Esmeralda; it was of almost a black colour, and the size of the common pacu. Although we saw them in numbers feeding on the herbs at the rocks, we did not succeed in securing more than one, which the Indians had cut up before I could inspect it."

D. 22—P. 15—V. 9—A. 43—C. 26—Br. 4—Vert. 36.

TETRAGONOPTERUS.

"TETRAGONOPTERUS, *Cuv.*—Caput minimum, lateraliter compressum. Oculi maximi, laterales. Os sat magnum, apertum quadratum; mandibula prominens. Dentes magni cuspidati, apice serrati in mandibulæ parte anteriore, et in duabus seriebus in latis ossibus intermaxillaribus totum marginem superiorem oris conformantibus; ossa maxillaria superiora parva retrorsum subarcuata, lateralia, dentibus minutissimus, ut in parte posteriore ramarum mandibulæ, armata. Lingua apice libera. Membrana branchiostega radiis 4 latis. Corpus squamis magnis tectum, compressissimum, latissimum. Pinnæ mediocres, analis latissima."

Two drawings appear to range in the above group, and neither of them do we find any where described, particularly the beautifully marked species which we have dedicated to our traveller.

T. LATUS, BROAD-SHAPED TETRAGONOPTERUS.—ARAWAAK, Cartaback; L. GERAL, Pacu.* *Schomb. Drawings*, No. 29.—This fish is nearly as broad as

* The name *Pacu*, in the L. Geral, is common to the form. —SCHOMB.

long, with the head small in proportion, and the outline, were it not for the tail, almost round; it "inhabits all the rivers of Guiana, and is much esteemed for the table. Its flesh is good and not bony, and it grows to fifteen or eighteen inches in length. The body is much compressed, ending in a keel on the belly, with a serrated spinous process of a silvery blue, yellowish as it nears the vent; the head and fins greenish; scaling very small, smooth-edged, adhesive; lateral line undulating; head small in proportion to its size; eye large, yellow, and silvery; nostrils double, cup-shaped, between the snout and the eye; tongue fleshy; lips ditto; teeth triangular, sharp,—seven in the lower jaw in single row, in the inter-maxillary double, six outward, and on inner row seven; vent situate about one-third of the length from the tail; gill-covers smooth-edged, opening semilunar; feeds on various kinds of fruit, and lives half an hour after being taken from the water. The body is elliptical; tail almost forked, and undulating. It is taken with the hook, but more frequently shot with the arrow, and, like the pirai, it is very voracious."

D. 22—P. 16—V. 8—A. 37—C. 27—Br. 2—Vert. 36.

SCHOMBURGK'S TETRAGONOPTERUS.

T. Schomburgkii.

PLATE XXII.

L. Geral, Pacu. *Schomb. Drawings*, No. 63.

We have dedicated this species to Mr. Schomburgk, as one of much interest from its colouring, and as remarkable for the development of its fins and the singular mark across the centre of the body. "It was caught in the Rio Negro in April, feeds on fruits, and swallows sand. The scales are small, elliptical, adhesive, and slightly serrated; a spine anterior to the dorsal fin; tongue round and fleshy; the intestines have numerous appendices; the roe double, and filling two-thirds of the cavity of the abdomen; the air-bladder is double, both portions of an oval form." In colour the head is pale olive, approaching to yellowish on the opercula, and below the eye is marked with three black spots; the eye large, with a yellow iris. The dorsal half of the fish is greyish blue, shading to white at the lateral line, but changing on the ventral half of the lower surface to pale yellowish green, marked with indistinct

black spots, and on the anal half of the lower surface it is of a paler tint of the bluish grey of the back, the centre of the body longitudinally only being white or silvery; across the centre of the body, in the opposite direction, or pointing between the insertion of the dorsal and anal fins, there is an oval mark of deep black, having a most remarkable and artificial appearance. The dorsal fin is deep bluish green, crossed by two dark bands; adipose fin olive, and set upon an elevated undulation of the back; the pectoral and anal fins small, and of an olive tint; the anal fin largely developed, dark bluish green, having the anterior tip broadly marked with black, the posterior edge margined with clear red. The tail at the base is bluish green, shading into black at the upper tip, after which a band of dull red margins the extremity and the centre of the undulated fork, crossing through nearly the middle of the lower lobe, which is of a paler green at its tip.

D. 25—P. 15—V. 8—A. 39—C. 27—Br. 4—Ribs, 13 pairs—Vert. 34.

Three species of fishes, which are generally arranged among the Salmon, have next to be noticed, before proceeding to those forms which seem to lead to the Carps or *Cyprini*.

XIPHOSTOMA.

" Xiphostoma, *Spix.* — Caput longissimum, acuminatum, tenue, subteres. Oculi minores, laterales. Os quam maximum, longissimum, transversum, armatum dentibus minutissimis, confertissimis, acutis, in toto suo margine; id est, in longissimis ossibus inter-maxillaribus, que totum oris marginem superiorem conformant, nec non in mandibula; ossa maxillaria superiora minima, perpendicularia ad commissuram maxillarum. Lingua magna, lata, apice libera. Membrana branchiostega radiis 4 gracillibus. Corpus elongatum, teres, squamis mediocribus duris obductum. Pinnæ ventrales parvæ, dorsalis pone ventrales, caudalis magna."

OCELLATED XIPHOSTOMA.

Xiphostoma ocellatum.

PLATE XXIII.

Arawaak, Pirapu; Macusi, Morowai; L. Geral, Pirapoco.
Schomb. Drawings, No. 7.

Though very nearly allied to the figure given by Spix as *X. Cuvierii*, we have ventured to place it distinct. The form of the tail, as particularly alluded to by our author, is more rounded, and there is no appearance given in the drawing to the lined

appearance occasioned by the structure of the scales. The mark at the base of the tail is distinctly surrounded or ocellated with yellow.

"This fish is common in the Essequibo, Rios Negro and Branco; in the latter river it is much used for food; its flesh is yellow, but well-flavoured, although rather bony; the body long, head pointed, teeth sharp; nostrils single, placed near the eye; all the opercles striated, but with smooth edges. The ventral fins are placed rather before the dorsal. It is of a lead colour, lighter on the belly; the fins are variegated with light red, which is the predominant colour of the tail; at its insertion is a black spot, with a crescent of bright yellow, something like the eye of a peacock's feather. The lateral line is nearly straight, the eye yellow, and tongue pointed. The cranium is hard and bony; snout elongated, and protruding considerably over the lower jaw. They take bait readily; but as they swim near the surface of the water, are easily killed with an arrow. They live only a short time when taken from the water, and soon turn to a brownish colour. The lateral line is straight; the tail forked, but each lobe is rounded." The length two feet; greatest depth three inches.

X. ocellatum,—

D. 10—P. 27—V. 8—A. 9—C. 30—Br. 4—Vert. 40.

X. Cuvierii, from Spix,—

D. 2/8—P. 26—V. 8—A. 3/8—C. 7/17/7.

HYDROCYON, Cuvier.

In Hydrocyon of Cuvier,* several modifications of form seem to occur, no less than five being noticed and referred to particular types of fishes:— 1. *Salmo falcatus*, Bloch.; 2. *Characinus Amazonicus*, Spix, xxxv.; 3. *Cynodon vulpinus*, Spix, xxvi.; 4. *Xiphostoma;* 5. *Characinus dentex*, Geof. The genus, therefore, would scarcely appear to be well defined, and we place our present drawing under it as approaching nearest in form to those species figured by D'Orbigny as *H. hepsetus*, *humeralis*, &c.

SMALL-SCALED HYDROCYON.

Hydrocyon microlepis.

PLATE XXIV.

Macusi, Ghawarrikang. *Schomb. Drawings*, No. 16.

"This fish is found in the Rios Negro and Branco, as well as in the Essequibo. In the upper part of the latter river they are very plentiful; and when the river is low, several hundreds are taken in a night by placing a canoe across a small creek which

* Regne Animal, vol. ii. p. 312.

they are descending, and in leaping over the obstacle fall into the canoe. They are good food, and, when fried, are much like the fresh-herring. The scaling is very minute; the colour is greenish on the head and back, varying to blue and rose on the belly; dorsal fin orange tipped with blue, adipose the same colour as the back, pectoral and ventral light blue, anal lake tipped with blue, caudal blue outer rays, others orange. At the insertion of the caudal fin is a black spot. The eye yellow; the opercles rose colour; nostrils single, placed near the eye; teeth formidable, the canines very large; the snout elongated; lateral line runs nearly straight, a little bent near the opercle; the gill-lid is slightly striated, with smooth edges; vent placed near the anal fin; the ventral placed under the commencement of the dorsal fin. They are killed by the arrow, and with the hook and line. They are very voracious, and constantly carry on warfare with the smaller finny tribes. They swim near the surface of the water, and seem to prefer shallows to the deeper spots."

STRONG-TOOTHED HYDROCYON.

Hydrocyon? armatus.

PLATE XXV.

Macusi, Patha; Warrau, Baiarra; L. Geral, Pirantera.
Schomb. Drawings, No. 8.

This remarkable and strongly armed fish should evidently have its station near to the last, but its true generic place is less easily determined from the drawing only. The structure of the teeth, as stated in Mr. Schomburgk's notes, requires attention; and the base of the anal fin is represented as being covered with scales for a breadth more than equal to the whole membranous part. It has some alliance also to *Cynodon* of Spix, one of Cuvier's types, where the anal fin is similarly scaled at the base.

"This fish is found in all the rivers of Guiana, and is known from all others by the length of the canine teeth, which are so long in the lower jaw as to protrude through the upper, into sockets prepared for their reception. It weighs ten or twelve pounds. The body silvery bluish green on the back; the head of the same colour. Dorsal fin is greenish, webbed with blue and tipped with red; pectoral

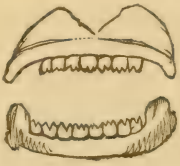
ditto, webbed with blue; ventral, greenish white; anal, green tipped with red; caudal, green tipped with red and a broad bar of black; over the opercle is a black spot, and at the sub-opercle another. The maxillary bone is strongly toothed; the bones of the gill-lid are all striated; the eye large and yellow, placed before the middle of the head; scaling middle-sized, adhesive; ventral fins under the commencement of dorsal; nostrils single, oval, close to the eye; mouth terminal, gape large; teeth in a single row, spare canine teeth lying flat in the mouth to supply again in case of breakage, like the fangs of poisonous snakes. It lives a short time only when taken out of the water, is good food, but bony, takes bait readily, and preys on smaller fish, which it swallows whole."

D. 12—P. 8—V. 9—A. 19—C. 24—Br. 5—Vert. 48.

In some of the specimens belonging to the genera Serrasalmo and Tetragonopterus we saw species reminding us, by their form, of the deeper shaped carps; in the fish we have next to describe, we see another resembling the ordinary form of the chub and roach, covered with large scales, having the mouth, though armed with teeth, protruding, and having the second dorsal fin almost rudimentary. They are also vegetable eaters, but their habits in other respects are too little known to allow us to deduce from them any affinity. Agassiz has characterised them, from the cut margins of their teeth, under the name of

SCHIZODON.

"Schizodon, *Agas.*—Caput parvum, latissimum, depressum. Oculi magni laterales. Os parvum, rotundatum ; dentes latissimi, apice crenati, incissivi in ossibus inter-maxillaribus latissimis, totum labium superius sustinentibus et in mandibula prominente. Ossa maxillaria superiora minima lateralia. Lingua minima. Membrana branchiostega radiis 4 latis. Corpus subteres, elongatum, squamis magnis duris obductum. Pinnæ mediocres."



The only specimen in the Collection, entering this genus, we have referred to

BANDED SCHIZODON.

Schizodon fasciatus, Agas.

PLATE XXVI.

Curimata fasciatus, *Spix*, tab. xxxvi.—L. Geral, Warracu. *Schomb. Drawings*, No. 27.

"The fish from which the drawing has been made was caught in the Rio Branco; it is of a dark grey colour, yellowish on the belly and head; the scaling is large, adhesive, round, and smooth at the edges; lateral line single, straight; head short, gently sloping; lips fleshy; mouth protractile; teeth obtuse, serrated, in a single row in the inter-maxillary and lower jaw; ventral fins placed under the pectoral; rudiment of a *pinna adiposa* above the anal fin, obtuse on the posterior extremity; (rays of dorsal and anal fins project in rather sharp points); nostrils double, oval; eyes middle-sized, silvery red above; tongue not perceptible. The gill-rays are not covered by the gill-lid, but free, and extend from its lower margin towards the throat; opercles smooth, with smooth edges; gill-opening semilunar, almost sharp-angled in the middle. The body is much elongated; back high. Is caught with the hook or shot with arrows, and lives but a short time

after being taken from the water. The food found in its stomach was the seed of the *awarra*, a species of palm (*Aristocaryon spec?*)

D. 12—P. 15—V. 8/9—A. 10—C. 21—Br. 4—Vert. 36.

ERYTHRINUS.

In this place we have ventured to arrange the genus Erythrinus, in variation to previous systems. Exteriorly, with the exception of the mouth, many species are Carps in appearance; but the structure of the mouth, and the pancreatic appendages to the stomach, ally them to the Salmons; while the spotting of some, and banding on the fins in others, remind us of both the Trouts and the Graylings. The last form prepared us for the want of the second dorsal fin; and in one which could be placed at the limits or commencement of a family, we should expect either a small development or total want of this accessary character.

"ERYTHRINUS, *Gronovius.*—Caput obtusum, rotundatum, extus osseum, rugosum, non squamatum; ossa infraorbitalia maxima, buccas omnino obtegentia. Os amplissimum, transversum, in toto suo margine dentibus majoribus minoribusque alternantibus armatum; ossa intermaxillaria mediocria, maxillaria superiora angusta, utrinque ultra dimidiam partem labii superioris sustinentia; ossa palatina dentibus velutinis obsita. Lingua latissima, plana, apice libera. Membrana branchiostega radiis 5. Corpus subteres, versus caudæ apicem subcompressum, squamis magnis tectum. Pinna dorsalis ventralibus opposita."

THE HAIMURA.

Erythrinus macrodon, Agas.

PLATE XXVII.

Erythrinus macrodon, *Agas.* tab. xviii.

Three drawings of Erythrini occur in Mr. Schomburgk's Collection, very closely allied to each other, and it is possible that they may be different states of the same fish; one we refer to the species of Spix above quoted, and have selected it as that alluded to in the Introduction, and as a fish capable of being extensively employed in economical purposes. Our notes state, "Lower part of snout produced; scales large, margined by a skin. Dorsal fin in the middle of the elongated body, situate above the ventral fin; anal fin placed far back; teeth of the lower jaw acute; tongue smooth, thick; mouth wide; rays of fins soft; palate set with teeth. Body compressed; back and abdomen produced, tapering suddenly towards the tail; central teeth longer than the others; scales deciduous; lateral line scarcely visible; ventral fin abdominal; margin of gill-flap smooth, surface striated; nose single near

the eye; eye large; air-bag obtuse above, pointed below.

"The haimura is one of the most delicious fresh-water fishes of Guiana, and the head is particularly recommended to all *gourmands*. It is generally caught in the neighbourhood of falls and rapids, and reaches sometimes a length of from three and a half to four feet. Its flesh is firm and well-tasted, and at certain seasons is so numerous that it constitutes the principal article of food with the Indians. It is very voracious, and is taken with the hook, as well as in traps and with spring-hooks. These traps are most ingenious, and consist generally of a cylinder made of bark, or frequently of a branch of the trumpet-tree (*Cecropia pellata*), which is hollowed out. The cylinder is about five feet long, and from six to seven inches in diameter. The lower end is stopped up, and a live fish is fastened to the bottom. It is now tied horizontally to a tree which stands on the bank of the river, and kept about two feet below the surface. The haimura, attracted by the bait, enters the cylinder; but scarcely has it put its head beyond the centre, when the lower end of the cylinder sinks and becomes vertical, and the fish being enclosed with its head downwards, it cannot make its escape, and is secured. The river Berbice, beyond the cataract Itabrú, and the Cuyuwini, a tributary of the Upper Essequibo, abounded in haimuras, and we sometimes caught a hundred weight in the course of an hour or two. Their teeth and jaws are very

powerful; and I have been told of accidents where the fish, when caught, has cut off a man's hand. —I have seen very serious wounds inflicted by them."

D. 15—P. 14—V. 8—A. 9—C. 17—Br. 4—Vert. 40.

Another of our drawings is similar in form, but is coloured lighter, and has the dorsal fin with four distinct dark bands, instead of being spotted as in the last. The native names are different from those of the last:—ARAWAAK, Huri; WARRAU, Cauhui; L. GERAL, Tari-ira. *Schomb. Drawings*, No. 44.—Our notes remark: "Is common in every river of Guiana, and is a very voracious fish. The scaling is large, with smooth edges, elliptical, and adhesive; lateral line straight, running to the middle of the body. The gill-covers have smooth edges, with the surface slightly striated; nostrils double, near the eye; eye large, red, and situate near the snout; teeth in single rows, large,—the canines very large and powerful; ventral fins at half distances from the pectoral; tail rounded; air-bag double,—one circular, flattish, the other long and pointed. Tongue round and fleshy; lower jaw slightly produced. Intestines form only one flexure, and have appendices. The roe is large, long, and double; eggs middle-sized. Destroys immense quantities of small fish, and will live an hour after being taken out of the water. The flesh is good, but inferior to many others, being bony: it does not keep long. The Indians make excursions to creeks and pools where they are plen-

tiful, and destroy great numbers, which they barbacote in the smoke to make them keep. In the Rio Negro, great numbers of them are taken and dried. They are sold at from two to three dollars per aroba of thirty-two pounds. They take bait with great avidity, and afford excellent sport to the angler and gain to those who live by taking them.

D. 15—P. 13—V. 8—A. 11—C. 18—Br. 5—Ribs, 23 pairs—Vert. 36.

CYPRINIDÆ OR CARPS.

The reasons which induce us (with our present knowledge of their structure) to place *Erythrinus* with the Salmon, remove *Prochilodus* from them: take away the second dorsal fin, and they would at once have been ranged here; and it seems as necessary to have among the Carps some form representing the Salmon, as there would be in the reverse of the proposition. In the internal structure the masticating stomach supplies the almost entire want of teeth, and the double air-bladder is similar to the form of that organ in the *Cyprini*. The characters of Agassiz are,—

"PROCHILODUS, *Agas.*—Caput parvum, crassum, latum. Oculi magni laterales. Os parvum in summo rostri apice, labio latissimo, carnoso, emergente omnino circumdatum. Dentes minutissimi, apice introrsum flexi in ipso margine labii carnosi. Ossa inter-maxillaria, et maxillaria superiora minima in labii substantia recondita. Lingua nulla. Membrana branchiostega radiis 4 latis. Corpus compressum, latum; squamis magnis duris obtectum. Pinnæ mediocres."

Among drawings of three species, we do not possess one agreeing with those figured in the Brazilian Fishes. The first may be designated

PALE RED-STREAKED SALMON-CARP.

Prochilodus rubro-tæniatus.

PLATE XXVIII.

Arawaak, Warrau, and Waccawai, Yacotta; L. Geral, Curimattu. *Schomb. Drawings*, No. 1.

The colour of the drawing above is of a pale brown, and the whole body is marked with bands of pale rose-colour. The *Paca lineatus* of D'Orbigny resembles this fish in form, and is striped somewhat similarly, but different in colour.

"This fish is found as well in the Rios Branco and Negro as in the Essequibo and its tributaries; the specimen from which the drawing was made was taken at Post Ampa; it weighs about two pounds, and is taken only by the arrow or with nets. They do not take bait; they are much esteemed for the table; the flesh is white and well-flavoured, but they do not keep long after being killed. The scaling is large and very slightly fringed, striated, elliptical, and adhesive; it is devoid of spinous processes; lateral line straight, and

about the middle of the body; head depressed; ventral fins situate under the dorsal, caudal forked, adipose moderately large. Ribs large, 22 pairs; air-bag double,—that next the head oval, the other long and pointed; nostrils *single*, near the top of the head, half distance between the snout and eye; eye round, near the middle of the head, iris red and yellow; tongue round and fleshy; lips fleshy, and formed for sucking; teeth none; intestines long, forming several flexures, and situate near the anal fin. The gill-covering is slightly striated, opening semilunar; on examination, it is possessed of a second stomach, one of which resembles the gizzard of a fowl, being muscular and fleshy, and which was filled with fine clay; no other food was found in either stomach. They live but a short time after being taken out of the water. The body is silvery; back darker, shaded with green, and slightly striped with purple; head greenish; dorsal, adipose, pectoral, and ventral fins slightly green; anal also green, with a patch of lake; the tail, lake, spotted with black. The length of the specimen was eighteen inches, depth below dorsal fin six."

D. 11—P. 15—V. 9—A. 10—C. 22—Br. 4—Vert. 40.

Two other species, very nearly resembling this in form, were taken in the Rio Branco, but they are not known in the Demerara or Essequibo rivers. They are represented on our next plates, show bright and variegated markings, and are supplied with minute teeth.

DOUBLE-MARKED SALMON-CARP.

Prochilodus binotatus.

PLATE XXIX.

Schomb. Drawings, No. 65.

This fish, regarding which we do not possess extended notes, "was shot with the arrow in the Rio Branco. In length it is thirteen inches and a half, in depth three and three-quarters. Teeth were thickly set in each jaw, and the tongue is stated as round and fleshy; at variance with the generic characters as given previously. The intestines have no appendices, and the air-bag is double." The upper part of the head is coloured dark olive, shading into yellowish, perhaps silvery on the opercula, and to pale pink on the lower part of the head. The back above the lateral line bluish gray, shading into silvery and tinted with greenish on the abdomen; and there are two conspicuous round black marks, the one at the commencement of the lateral line behind the gill-cover, the other at the termination of the line at the insertion of the tail. Dorsal fin is bluish green, second dorsal olive; the pectoral and anal fins are pale greenish grey, tinted with

pink at the base, the latter tipped with bright red; the anal fin yellowish green, edged with bright red, and with two indistinct dark bands across the anterior tip. The tail, deeply forked, is dull yellow; there is a central longitudinal band or stripe of dull light blue, succeeded across each lobe by three others of a similar colour and equidistant, and terminated by the tips, also blue. The eye is large and coloured yellow.

D. 11—P. 13—V. 9—A. 10—Br. 4—Ribs, 19 pairs—Vert. 38.

BEAUTIFUL SALMON-CARP.

Prochilodus insignis.

PLATE XXX.

L. Geral, Geraki. *Schomb. Drawings*, No. 26.

"This fish inhabits the Rio Branco, where it is plentiful and esteemed for food. It is killed by the arrows, as it will not take bait, and in its general manners resembles Plate XXVIII. Its colour is a silvery blue, inclining to rose on the belly. Head greenish, eyes yellow and red. The lips are fleshy and formed for sucking; ventral fins situate under the dorsal; gill-lid smooth, the opening

semilunar. It has no teeth; nostrils single, placed between the eyes and snout, but nearer the top of the head. The scaling is large, striated, elliptical, adhesive, and slightly fringed; lateral line single, straight; head and body slightly depressed; the tongue fleshy, and attached to the lower jaw. It lives only a few minutes after it has been taken out of the water. The air-bag is double, and is possessed of a second stomach, which is generally filled with fine clay. Length eleven inches and a half, depth three inches and three-quarters."

This is even more gaudily coloured than the last. The colour above runs into streaks, pale but regular, as on the first described species. The anal fin is deep lake, crossed, as in the last, anteriorly with two dark bands, and having a third running through the posterior angle. The tail is bright orange red, and has the central dark stripe, with five narrow equidistant black bands crossing each lobe. In both the last fishes, the lateral line is nearly straight.

D. 9—P. 14—V. 8—A. 9—C. 22—Br. 4—Vert. 38.

Our limits will not now allow us to proceed with the *Acanthopterigii*, of which numerous species accompany the Collection; and they, with the cartilaginous fishes and a few insulated forms, will be illustrated in another Volume. Before concluding, however, we may remark, that our *Arius? obesus*,

page 171, may be the *Silurus galeatus* of Bloch, pl. cccIxxix.; our *Hydrocyon microlepis* is somewhat similar in form to the *H. falcirostris*, *Annales du Museum*, tom. v. pl. 27, fig. 3; and *H.* (*cynodon*) *armatus* is nearly allied to *H. schomberoides*, pl. 27, fig. 2, of the same work.

END OF THE FIRST VOLUME.

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ACANTHICUS HISTRIX
fort St. Joaquim in the distance

HYPOSTOMA SQUALINUM.

DORAS CASTANEO VENTRIS

ARIUS ONCINUS.

PIMELODUS AREKAIMA.

PIMELODUS INSIGNIS.

PIMELODUS NOTATUS.

PLATYSTOMA TIGRINUM.

HYPOTHALMUS DAVALLA.

Dorsal Spine

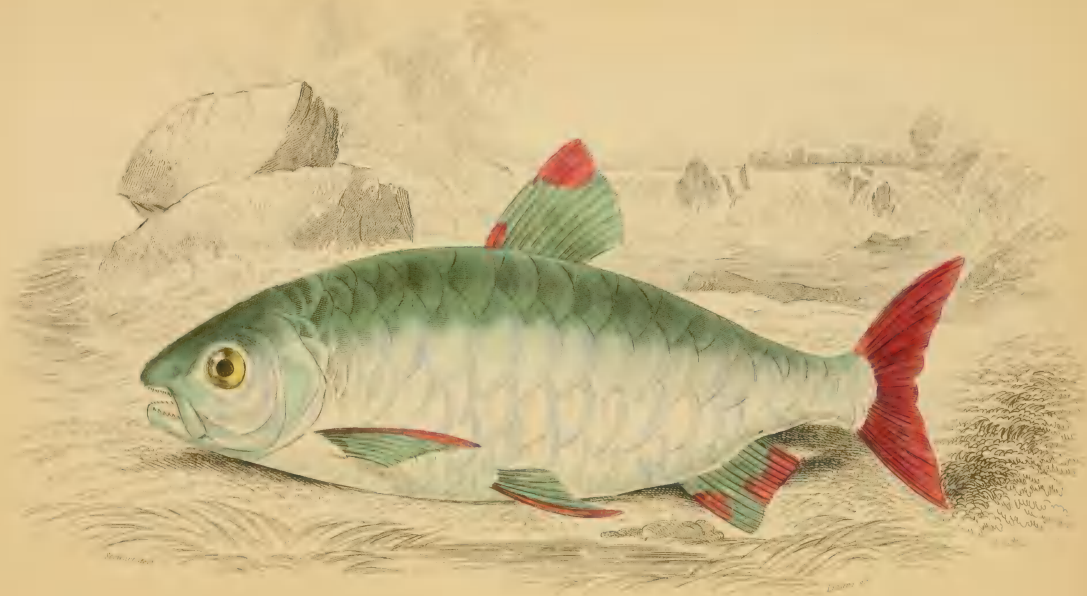
of

Silurida.

Lizars sc.

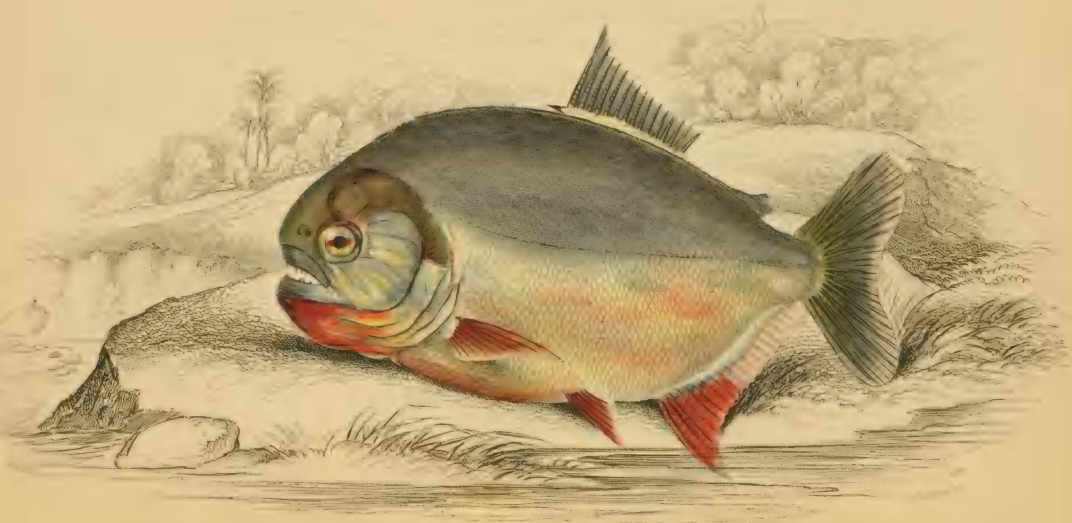
OSTEOGLOSSUM AROWANA.

Fig.1.Chalceus labrosus. Fig.2.Chalceusengraveteæniatus.



CHALCEUS MACROLEPIDOTUS

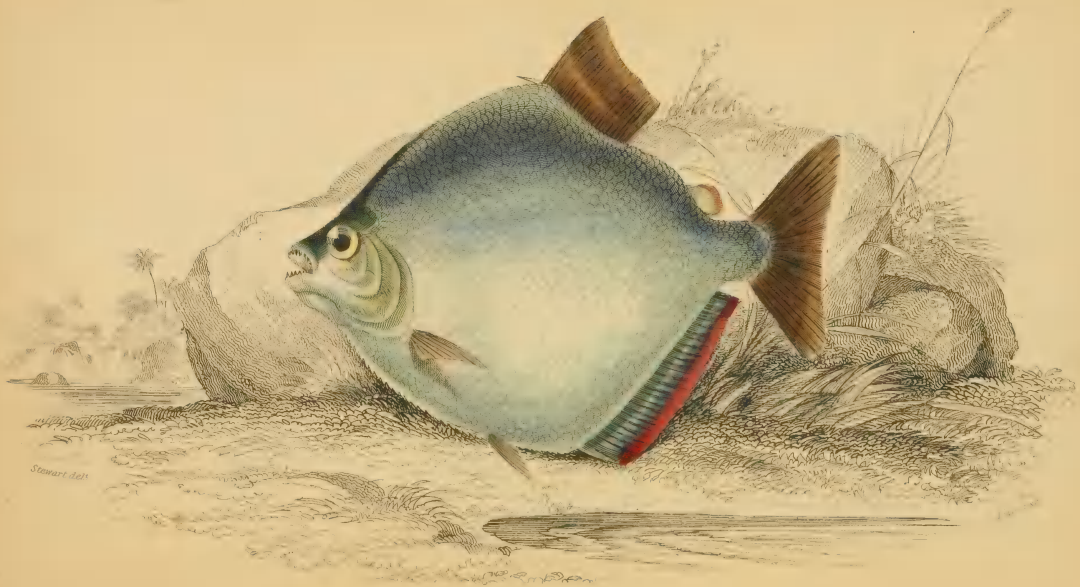
ANODUS NOTATUS.



SERRASALMO PIRAYHA

SERRASALMO PUNCTATUS.

SERRASALMO NIGER.

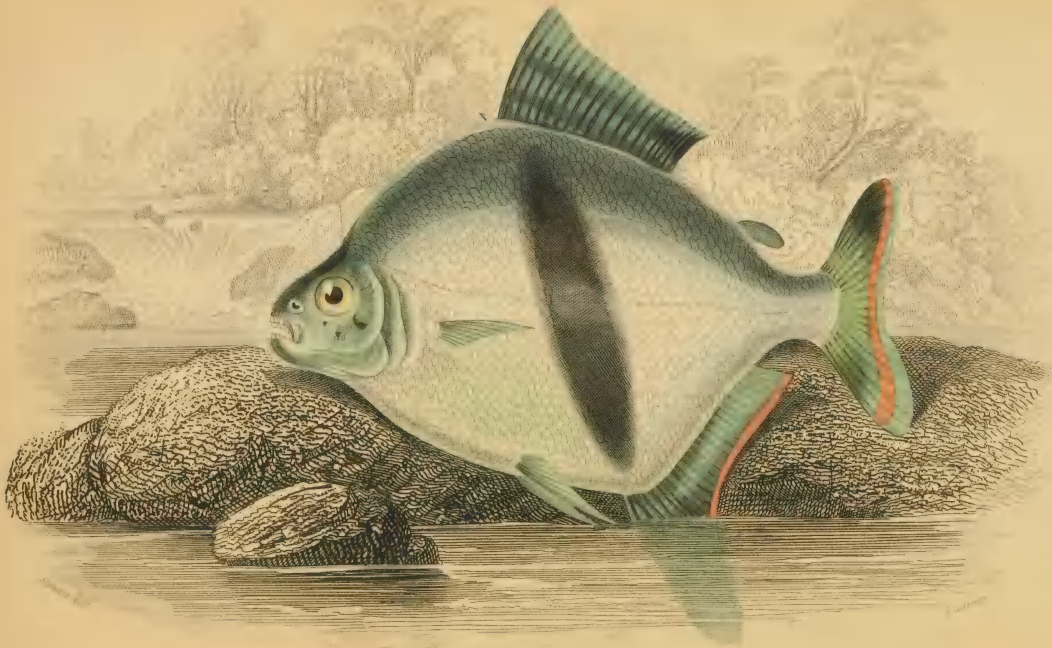


SERRASALMO EMARGINATUS.

MYLETES PACU.

PLATE 20.

MYLETES PACU.



TETRAGONOPTERUS SCHOMBURGKII

XIPHOSTOMA OCELLATUM.

HYDROCYON? ARMATUS.

HYDROCYON ARMATUS

Stewart del.

SCHIZODON FASCIATUS

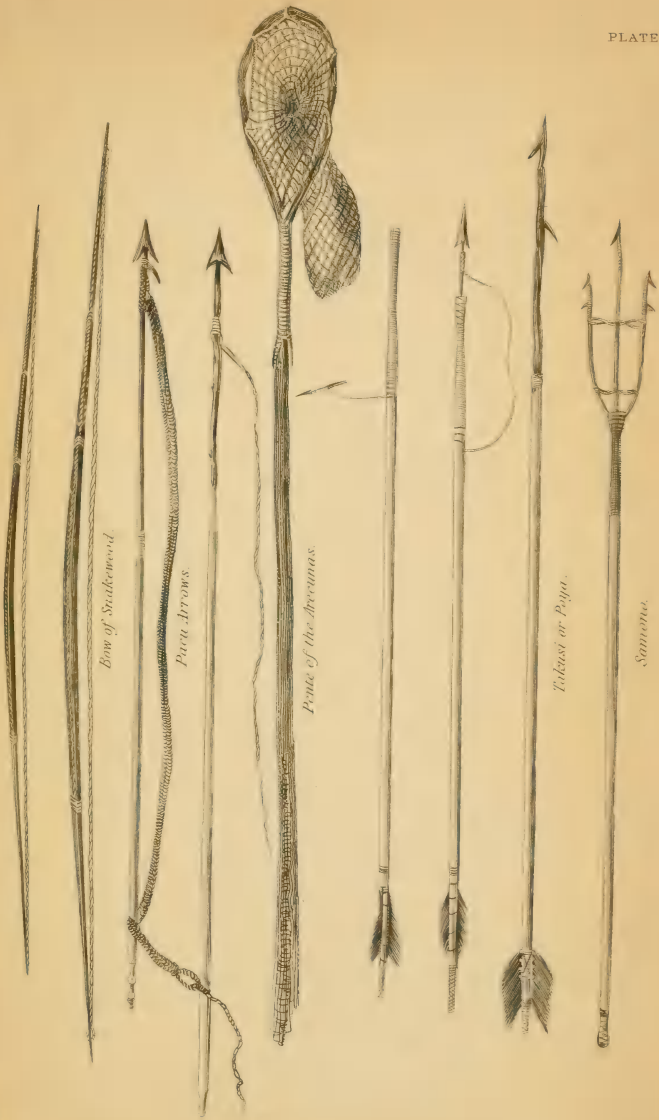
BERTHIER'S MARBLOCK

PLATE 27

PROCHILODUS RUBRO-TÆNIATUS.

PROCHILODUS BINOTATUS.

PROCHILODUS INSIGNIS



Fishing implements of Guyana.

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